ANTARCTIC MINERALS POLICY

HEARING

BEFORE THE

SUBCOMMITTEE ON TRANSPORTATION, AVIATION AND MATERIALS

AND THE

SUBCOMMITTEE ON SCIENCE, RESEARCH AND TECHNOLOGY

OF THE

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
U.S. HOUSE OF REPRESENTATIVES

ONE HUNDRED FIRST CONGRESS

SECOND SESSION

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ANTARCTIC MINERALS POLICY

THURSDAY, JULY 12, 1990

U.S. HOUSE OF REPRESENTATIVES, COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY, SUBCOMMITTEE ON TRANSPORTATION, AVIATION AND MATERIALS, SUBCOMMITTEE ON SCIENCE, RESEARCH AND TECHNOLOGY,

Washington, DC.

The subcommittees met, pursuant to notice, at 10 a.m., in Room 2318, Rayburn House Office Building, Hon. Robert G. Torricelli (chairman of the Subcommittee on Transportation, Aviation and Materials) presiding.

Mr. TORRICELLI. The subcommittees will come to order.

I am pleased today to be sponsoring a joint hearing with Mr. Valentine of North Carolina, who will be joining us shortly, on the question of Antarctic mineral policy and related issues.

In particular, we will focus on the Convention on Regulation of Antarctic Mineral Resource Activities, an agreement to provide a formal means for regulating exploration and development. This agreement was signed by the United States and some 18 other nations in 1988, and is now awaiting presentation to the Senate for confirmation.

Even without formal presentation, this agreement has proven to be controversial. While no minerals, including oil, of any economic worth, have been discovered to date in the Antarctic, many fear that the ratification of such an agreement would promote the development of mining and drilling in this environmentally sensitive region.

France and Australia, two of the nations adhering to the Antarctic treaty system now governing the area, and several environmental groups, oppose the pact, seeking instead a ban on any exploration. On the other hand, proponents of the Agreement argue that strict provisions would provide the only real means for protecting this world ecological and scientific resource. As the world's last non-sovereign pristine wilderness, we must decide soon how we will treat this continent, and what role we as a nation should take.

Since the mid-1950s, the United States, together with other signatory nations of the Antarctic treaty, have treated the Antarctic as a scientific preserve. With the exception of a few tourists, the main activity in the Antarctic has been to conduct scientific research, presumably of benefit to all mankind.

The original 12 signatory nations has now grown to 22. These nations, together with a dozen or so more other interested nations, were involved in developing a minerals agreement. Many of these nations, in the interest of science and international goodwill, have

set aside their sovereignty claims, claims that could be overriding in the event that a minerals discovery of significant size should occur in the future.

The discovery of the ozone hole over the Antarctic in recent years, coupled with the growing concerns for global climate changes, have made us increasingly aware of how important this distant continent is to our everyday life. Together, we must address a number of questions, as we ponder the future of this important natural resource.

Can we afford to leave the use of the Antarctic unregulated, as it is now, regarding minerals exploration and development? Or do we need to provide rigorous safeguards? Is it possible to impose a total ban on minerals exploration and development, creating a world park? What would be the impact on scientific research if we impose a comprehensive environmental regime?

These and other questions are the subject of this hearing. I am looking forward to hearing from the witnesses, and hearing their views on these and other related issues.

Gentlemen, welcome. Thank you each for your cooperation today. We appreciate your taking the time to be with us.

For our first presentation, we will hear from Peter Johnson, Office of Technology Assessment, accompanied by Mr. James Mielke, Congressional Research Service.

Gentlemen, welcome, and I thank you. Mr. Valentine, who is cohosting this hearing, is now joining us as well. Mr. Valentine, do you have an opening statement you would like to make?

Mr. VALENTINE. Yes, Mr. Chairman, I do, and thank you very much. I am happy to be a part of this proceeding, and look forward with interest to what the witnesses have to say.

Clearly, concerns about the preservation of the fragile Antarctic environment have taken center stage in public discussions of the proposed treaty. This hearing will continue to explore this important issue.

But another aspect of the Minerals Convention which we would also like to consider this morning concerns its possible effect on the conduct of scientific research. The United States has been a major participant in the modern era of multinational scientific research activities in the Antarctic region, which grew out of the International Geophysical Year of 1957–58.

Research in Antarctica has achieved greater visibility and importance in recent years, with the realization of the significant influence of this region on global climate. Clearly, all nations have a stake in the outcome of research activities in the Antarctic, and many nations have worked together harmoniously over the past 30 years to make scientific progress.

At present, support for U.S. Antarctic research and logistical support for the U.S. presence in Antarctica are the responsibilities of the National Science Foundation. Ratification of the proposed minerals treaty and passage of implementing legislation could possibly place additional responsibilities on NSF.

We are interested in exploring whether NSF would be the appropriate agency to discharge these new functions, and whether NSF's research support activities would be adversely affected.

We would also like to determine if there are any special concerns on the part of the scientific community that the proposed treaty or associated implementing legislation might impede scientific research activities in Antarctica. I want to join with you, Mr. Chairman, in welcoming the distinguished group of witnesses here this morning, and look forward to their testimony.

Thank you, sir.

Mr. TORRICELLI. Thank you, Mr. Valentine.

I would like to inform the witnesses that their written statements will be included in the record in their entirety, but in any way that you would like to summarize it, or address any of these issues, we appreciate your testimony.

[The prepared opening statements of Ms. Schneider, Mr. Lewis, and Mr. Costello follow:]

THE HONORABLE CLAUDINE SCHNEIDER
STATEMENT ON
SRT/TAM HEARING ON ANTARCTIC MINERALS POLICY
JULY 12, 1990

Antarctica plays a vital role in regulating the climate of our global environment, especially in limiting global warming. Antarctica's glacial cap reflects up to 80% of the solar radiation it receives. This radiation is spun through the Antarctic air and ocean currents, thus, moderating the heat absorbed in the Tropics and reducing the earth's mean temperature. In fact, it was research conducted in Antarctica which provided the first warning of an expanding hole in the ozone layer and the threat of global warming.

Things have changed considerably in the past eight years since the United States first began negotiating the Wellington Convention in 1982. At that time, it seemed like an excellent idea to at least limit and regulate mineral exploitation. But, we have entered a new decade and consequently have emerging concerns.

Since 1982, we have seen our relations with the Soviet Union and East European nations change dramatically. Our understanding of the Antarctic's regulatory role in the climate of the entire earth is much more clear. Furthermore, we have witnessed how vulnerable the continent is to environmental accidents, as illustrated by the grounding of the Argentine supply vessel Bahia Paraiso. The vessel ran aground over a year ago and is still leaking oil into Antarctic waters.

There appears to be an opportunity for Antarctica to become an international nature reserve, and to be permanently off-limits to oil and mineral development. I strongly support this concept and believe that the United States should be a leader in making this a reality.

HON. TOM LEWIS (R-FL)

OPENING STATEMENT

TAM/SRT HEARING ON ANTARCTIC MINERALS POLICY

JULY 12, 1990

THANK YOU, MR. CHAIRMAN.

ANTARCTICA, WITH AN AREA OF 5.1 MILLION SQUARE MILES, COVERS APPROXIMATELY ONE-TENTH OF THE EARTH'S LAND. ICE OVER A MILE THICK COVERS 98 PERCENT OF ITS SURFACE.

IN 1958, THE U.S. PROPOSED AN ANTARCTIC TREATY "DESIGNED TO PRESERVE THE CONTINENT AS AN INTERNATIONAL LABORATORY FOR SCIENTIFIC RESEARCH AND INSURE THAT IT BE USED ONLY FOR PEACEFUL PURPOSES." THE TREATY WAS SIGNED BY TWELVE NATIONS, INCLUDING THE U.S, AND WENT INTO EFFECT IN 1961. HOWEVER, THE TREATY DID NOT ESTABLISH GUIDELINES FOR MINERAL RESOURCE ACTIVITIES.

NEGOTIATIONS, BEGUN IN 1981, LEAD TO THE CONVENTION ON THE REGULATION OF ANTARCTIC MINERAL RESOURCE ACTIVITIES (CRAMRA) IN 1988, WHICH IS THE FOCUS OF TODAY'S HEARING. THE CONVENTION WAS NEVER OFFICIALLY RATIFIED BY ANY COUNTRY ATTENDING.

ALTHOUGH NO MINERAL DEPOSITS OF COMMERCIAL INTEREST HAVE BEEN DISCOVERED YET, THE POTENTIAL FOR SUCH DISCOVERIES IS INCREASING. THERE IS CONCERN, AS EXPRESSED IN A 1989 OTA REPORT ON ANTARCTICA, THAT MAJOR DISCOVERIES MADE IN THE ABSENCE OF AN INTERNATIONAL AGREEMENT ON ANTARCTIC MINERALS COULD LEAD TO A "GOLD RUSH", DAMAGING ALL U.S. ANTARCTIC INTERESTS. WHAT WE NEED IS TO STRIKE A PROPER BALANCE BETWEEN ENVIRONMENTAL CONCERNS AND MINERAL RESOURCE INTERESTS.

THEREFORE, THE QUESTION REMAINS, SHOULD THE U.S. RATIFY THE CONVENTION SO THAT THESE ISSUES CAN BE OFFICIALLY ADDRESSED? OTHER QUESTIONS BEFORE US ARE:

WHAT CRITICAL MATERIALS EXIST AND WHAT RESEARCH IS NECESSARY TO DETERMINE THEIR LOCATION AND AMOUNTS?

WHAT WOULD BE THE ENVIRONMENTAL IMPACT OF EXTRACTING THESE MINERALS AND WILL IT BE UNACCEPTABLE IF WE ARE TO PRESERVE THE FRAGILE ENVIRONMENT?

THESE ARE QUESTIONS THAT I HOPE WILL BE ANSWERED DURING TODAY'S HEARING. I LOOK FORWARD TO THE TESTIMONY FROM THE WITNESSES.

THANK YOU, MR. CHAIRMAN.

OPENING STATEMENT

BY U.S. REP. JERRY F. COSTELLO, ILLINOIS

COMMITTEE ON SCIENCE, SPACE AND TECHNOLOGY

SUBCOMMITTEE ON SCIENCE, RESEARCH AND TECHNOLOGY AND

SUBCOMMITTEE ON TRANSPORTATION, AVIATION AND MATERIALS

JULY 12, 1990

"ANTARCTIC MINERALS POLICY"

Mr. Chairman, this hearing focuses on the Antarctic Minerals Treaty. Along with other countries, the United States signed the Convention on Regulation of Antarctic Mineral Resource Activities (CRAMRA).

As we look towards ratifying the 1988 Treaty, we must address several questions. I find it very important to find what activities the National Science Foundation will be responsible for if the treaty is ratified. And, if the United States confirms the treaty, what will the environmental costs be?

I look forward to hearing the testimony of our witnesses today as we try and address these and other important questions. I thank the Chairman for bringing this important issue to the attention of the House.

Mr. TORRICELLI. Mr. Johnson, please proceed.

STATEMENT OF PETER A. JOHNSON, OFFICE OF TECHNOLOGY ASSESSMENT; ACCOMPANIED BY JAMES MIELKE, CONGRESSIONAL RESEARCH SERVICE

Mr. JOHNSON. Thank you, Mr. Chairman. I will just highlight some of the important points in my testimony, with your permission.

It is a pleasure to be here today to discuss the Antarctic Minerals Convention as well as other issues related to the future uses and preservation of the Antarctic continent. At OTA, Bill Westermeyer, who is not able to be here today, plus James Mielke, and myself, were jointly responsible for a study that OTA published last fall entitled "Polar Prospects" that evaluated U.S. and international interests reflected in the new Convention on the Regulation of Antarctic Mineral Resource Activities.

It also analyzed issues related to the need for a treaty and effects the treaty might have on future activities. As you have stated, since the publication of our report, a number of proposals have been put forward to reconsider the positions reached by the nations who negotiated the Convention. At the present time, proposals for the adoption of the Convention are uncertain.

I would like to first highlight a couple of the findings that OTA reached in its study. First of all, our analyses indicate that significant commercial interest in minerals in Antarctica has yet to materialize. Even under the most favorable scientific, political and economic assumptions, minerals exploitation is still some decades away.

Another key finding of our assessment is that regulations governing possible future minerals activities in Antarctica are important, whether or not resources are ever developed there.

The regulations embodied in the Minerals Convention provide a focus on protecting the Antarctic environment. If the Minerals Convention comes into force we also have concluded that it does not necessarily follow that resource development will or will not take place.

At the same time the Minerals Convention promotes other historic U.S. interests in Antarctica, such as maintaining peace and preserving stability among the treaty nations.

Finally, it appears that a current proposal to establish Antarctica as either a world park or a preserve, as an alternative to adopting the Minerals Convention, deserves careful consideration. But we are not aware of the fact that they have needed support of the world community as of yet.

I have a comment on the mineral resource potential. One of the factors that motivated the key stakeholders in Antarctica to negotiate the Convention was increasing geological knowledge about Antarctica, and with this a growing awareness that Antarctica might contain mineral resources of potential commercial value. However, very little is currently known about Antarctica's mineral resource potential, and of the likelihood, from a technical and economic perspective, of developing any resources that may be discovered.

Regarding technical and economic considerations, the rigorous environment of Antarctica would be a formidable obstacle to anyone interested in exploring for and developing Antarctic resources. Offshore petroleum production, if indeed it ever takes place, is likely to be more difficult than existing production anywhere else in the world. The physical difficulties are such that it is unlikely that anything but world class deposits—that is giant and supergiant fields of billions of barrels of oil at high production rates—would be feasible to develop, and the oil price needed to do so economically would be, we estimate, at least double today's oil prices, and perhaps much higher.

As with petroleum, only world class hard minerals deposits—that is very large, high-grade deposits—could be economically developed in Antarctica. At best, one could not expect to find more than a handful of substance deposits in the exposed areas around the perimeter of the continent. Virtually all of the economic minerals known to occur in Antarctica are currently abundant and much less expensive to mine in other, more accessible areas of the world.

Regarding some details of the Minerals Convention itself, the Convention, although it is only a framework, contains some stringent controls on minerals activities. As general principles, no activity may take place unless the parties agree that scientific information is adequate to make informed judgments, that proposed activities will not result in any significant environmental impacts, that technology and procedures are available for safe operations, and that the capacity exists to respond effectively to accidents.

In addition, opening an area to consideration for exploration and development must specifically be approved by consensus of all parties. That does not mean, however, that there are not problems with some parts of the Convention from an environmental perspective. While the environmental requirements and sanctions form a potentially strong environmental framework, there are still some open issues.

For example, the Convention leaves out details that will need to be elaborated on by the institutions established by the Convention itself. For instance, what do terms such as "adequate" and "significant" mean in relation to environmental measures? Also, it is difficult to predict how well the compliance and enforcement provisions of the Convention will work, an area that has been difficult to accomplish in the past.

Regarding implementing legislation, if the United States does ratify the Minerals Convention and it enters into force, the next step would be to enact domestic legislation implementing the Convention. That could provide general guidelines to the Administration, as did the Marine Living Resources Convention, or more specific guidelines.

As a minimum, Congress will want to consider which agency or agencies to assign responsibilities for matters relating to the minerals activities, and what activities will be acceptable, and what procedures govern the acceptability of applications, since the governments must sponsor anyone who would engage in minerals activities.

Congress must also address the interim liability measures governing prospecting, since this activity would commence as soon as

the Convention enters into force. Although general liability provisions governing all minerals activities are contained in the Convention, a separate, more detailed liability Protocol must be negotiated before any exploration and development would be allowed.

A comment on alternatives that have been proposed—and as you know these alternatives that some have proposed is a permanent ban on all minerals activities throughout the continent, possibly by formally designating Antarctica as a world park. Such a proposal has obvious appeal. It is not clear from our evidence that it would be accepted by all the key stakeholders, and there may be some problems meeting the stated objectives of the proponents.

If the Convention does not enter into force, the most likely result will be a continuation of an uncertain regime, while countries seek a new compromise. One concern is that some country would consider itself no longer bound by current agreements to refrain from minerals activities, pending timely entry into force of the Convention, and thus attempt to proceed with some minerals projects.

In sum, the Minerals Convention is not completely satisfactory to either commercial or environmental interests. In the long run, however, other interests may be also important, including political stability of the region, and enabling it to remain demilitarized, and to pursue scientific research.

Thank you very much.

[The prepared statement of Mr. Johnson follows:]

TESTIMONY OF PETER A. JOHNSON

OCEANS AND ENVIRONMENT PROGRAM
OFFICE OF TECHNOLOGY ASSESSMENT

BEFORE

THE SUBCOMMITTEE ON TRANSPORTATION, AVIATION AND MATERIALS
AND
THE SUBCOMMITTEE ON SCIENCE, RESEARCH AND TECHNOLOGY

OF

THE HOUSE COMMITTEE ON SCIENCE, SPACE AND TECHNOLOGY

ON

ANTARCTIC MINERALS POLICY

JULY 12, 1990

Mr. Chairman:

Thank you for the opportunity to testify at this hearing on the subject of the Antarctic Minerals Convention and other matters relating to future uses and preservation of the Antarctic continent. The Office of Technology Assessment published a report titled "Polar Prospects" in September, 1989. That report evaluated U.S. and international interests reflected in the new Convention on the Regulation of Antarctic Mineral Resources Activities (CRAMRA). It also analyzed the issues relating to the need for such a treaty as well as the effects of the treaty on future activities in Antarctica.

Since the publication of the OTA report, a number of proposals have been put forward to reconsider the positions reached by the nations who negotiated the Minerals Convention. As you know, the convention was adopted in June, 1988 by the 20 nations who negotiated it over the past eight years, but, to date, none have taken final action to ratify it. Seventeen of these 20 nations, including the United States, have signed the Minerals Convention, but Austrailia and France have announced they will not sign it but will seek instead to gain a consensus on a comprehensive environmental protection agreement. Several U.S. legislative proposals also call for similar action.

My testimony will focus on three subjects important to the consideration of the Minerals Convention and how it may influence the future of Antarctica: 1) The prospects for minerals development in Antarctica, 2) The role of the Minerals Convention in promoting resource development and protecting the environment, and 3) the prospects for and effects of an alternative regime.

OTA's analysis indicates that significant commercial interest in Antarctic minerals development has yet to materialize and that, even under the most favorable scientific, political and economic assumptions, minerals exploitation is still a few decades away. Another key finding of the OTA assessment is that regulations governing possible future minerals activities in Antarctica are important whether or not resources are ever developed there, and, that the regulations embodied in the Minerals Convention provide a substantial focus on protecting Antarctica's environment. If the Minerals Convention comes into force, it does not necessarily follow that resource development will or will not take place. At the same time, the Minerals Convention promotes other historic U.S. interests in Antarctica such as maintaining peace and preserving stability among the treaty nations as a whole. Finally, current proposals to establish Antarctica as a world park as an alternative to adopting the Minerals Convention deserve careful consideration, but they do not yet appear to have the needed support of the world community.

Antarctica's Mineral Resource Potential

One of the factors that motivated the key stakeholders in Antarctica, the Antarctic Treaty Consultative Parties (ATCPs), to negotiate the Minerals Convention was steadily increasing geological knowledge about Antarctica, and with this, a growing awareness that Antarctica might contain mineral resources (e.g., oil, gold, or copper) of potential commercial value. However, very little is currently known about Antarctica's mineral resource potential and of the likelihood, from *technical* and *economic* perspectives, of developing any resources discovered in Antarctica.

Although small quantities of a variety of minerals have been discovered, there are no known deposits of commercial interest in Antarctica. The continent is, however, similar to other continents and is expected to contain some sizable deposits. How many potentially valuable mineral deposits Antarctica might contain is an open question, but most are likely to be in the 98 percent of Antarctica that is buried by thick ice--and therefore inaccessible.

The Antarctic Peninsula--the banana belt of Antarctica--presents the best opportunity for finding hard mineral deposits on the continent, in part because of the greater proportion of exposed rock there. Base metal deposits, such as copper, lead, and zinc, and precious metals, such as gold and silver, could be discovered in this region. As for petroleum, the best prospects are the several offshore sedimentary basins surrounding the continent. The most interesting areas are the Weddell and Ross Seas in West Antarctica, and Prydz Bay and the Wilkes Land margin in East Antarctica. While some Antarctic basins may ultimately attract commercial interest, what little evidence exists suggests that Antarctica may not be a significant petroleum area. However, until detailed exploration in Antarctica's sedimentary basins is carried out, including extensive seismic surveys and exploratory drilling, meaningful estimates of petroleum potential cannot be made with any existing methods of analysis.

Technical and Economic Considerations: The rigorous environment of Antarctica would be a formidable obstacle to anyone interested in exploring for and developing Antarctic resources. Offshore petroleum production, if

indeed it ever takes place, is likely to be more difficult than existing production anywhere else in the world. The physical difficulties are such that it is unlikely that anything but world class deposits--that is, giant or supergiant fields--would be feasible to develop, and the oil price needed to do so economically would be more than double today's oil price. Such large fields are very rare throughout the rest of world and are expected to be at least as rare in Antarctica too--making it especially unlikely to find one in those areas where exploitation could be both technically feasible and environmentally acceptable. Even under the most favorable political, technical, geological, and economic assumptions, commercial oil development appears unlikely before about 2020. By this time, much of the necessary technology--which is now being developed for use in other difficult offshore environments--should be available. If the deposits are there, and if the political and economic climate is appropriate (big ifs), the oil industry would be interested.

In the long run, the environmental acceptability of petroleum production is likely to be a more limiting factor in Antarctica than production technology. A concern that is particularly prominent in the wake of the Exxon Valdez and Bahia Paraiso[1] accidents is the capability to prevent and/or respond to large oil spills in such a remote and difficult operating area.[2]

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[1] The Bahia Paraiso, a double hulled, transport/tourist ship operated by the Argentine Navy, ran aground on January 28, 1989 off the northern tip of the Antarctic Peninsula near the U.S. Palmer Station. About 170,000 gallons of diesel fuel were spilled.

[2] See U.S. Congress, Office of Technology Assessment, Coping With an Oiled Sea: An Analysis of Oil Spill Response Technologies (Washington, DC: U.S. Government Printing Office, March 1990).

The capability to do so does not currently exist. Under the terms of the Minerals Convention, this capability would be required before exploration and development could proceed.

As with petroleum, only world class hard minerals deposits--that is, very large, high grade deposits--could be economically developed in Antarctica. At best, one could not expect to find more than a handful of such deposits in the exposed areas around the perimeter of the continent. Moreover, virtually all of the potentially economic minerals known to occur in Antarctica are currently abundant and much less expensive to mine in other, more accessible areas of the world, and are unlikely to be exploited in Antarctica in the foreseeable future. Precious metals, such as the gold and platinum group, if discovered in the relatively accessible Antarctic Peninsula, could be of more immediate interest. Nevertheless, given the long lead times required for development, even if a significant discovery were made today and development approved immediately (an unrealistic assumption), such a deposit would not likely be developed for at least a decade. Much of the technology for development of hard mineral deposits in Antarctica's ice-free areas is available now and is being used in the Arctic.

Environmental Impacts: If minerals exploration and development is allowed to proceed in some areas, there will be some unavoidable environmental impacts. Mere construction of facilities, for instance, not to mention land-based mining itself, will have significant, if only local, impacts. Also, some accidents are inevitable. A large oil spill could have regional and long-lasting impacts. To date, human impacts have been limited mainly to

research stations, most of which are located on the relatively small ice-free areas. Antarctica is still remote from centers of industry and still relatively uncontaminated. However, human activities other than those related to minerals activities have been increasing in Antarctica and are likely to continue to grow. Minerals exploration and development is not expected to be a near-term concern. Of more importance in the near-term will be activities related to science, tourism, harvesting of living resources, and perhaps minerals prospecting.[3]

There is now little disagreement that the time is overdue to establish more comprehensive and vigorous measures for protection of the Antarctic environment. The form such measures might take and the relationship of comprehensive measures to the environmental regulations established in the Minerals Convention and other Antarctic agreements is still a subject of debate.

The Minerals Convention--Overview

The Minerals Convention creates the means for determining the acceptability of mineral resource activities and for regulating any activities determined to be acceptable. Like all treaties, it is the result of compromises among parties with different interests. Its final form, like that of the Antarctic Treaty itself and other associated agreements, owes much to the fact that a conflict exists over who, if anyone, owns Antarctica. Most of

[3] The Minerals Convention contains precise definitions of the terms prospecting, exploration, and development. Prospecting generally consists of seismic surveying and shallow sample-taking and is not expected to have significant impacts on the environment.

the continent has been claimed by seven countries,[4] but no other countries with interests there accept the validity of those claims. (Chapter 2 of Polar Prospects contains a discussion of the relevant history of the United States and other countries in Antarctica and of the legal status of the continent, without which knowledge the Minerals Convention cannot be thoroughly understood.)

The Convention is also a result of the desire of ATCPs to afford strong protection to Antarctica's environment yet still allow for the *possibility* of minerals activities in and around the continent. Few, if any, countries have only one type of interest in Antarctica. The attempt to balance competing interests among "claimants" and "nonclaimants," among developed and developing countries, and among countries that stress environmental protection and those that prefer a regime that would facilitate minerals development is key to understanding the composition, voting procedures, decision making authority, and other checks and balances established by the Convention. Given the history of the claims, the multilateral nature of the negotiation, and the conflicting interests at stake, it is unlikely that a fundamentally different agreement could have resulted from the past eight years of negotiation.

The Minerals Convention suffers from a name that implies to some that the ATCPs are anxious to begin exploiting Antarctica's mineral resources. In fact, most of the negotiators agree that the Minerals Convention does not promote Antarctic minerals exploration or development. Equally, it does not

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[4] Argentina, Australia, Chile, France, New Zealand, Norway, and the United Kingdom.

ban these activities either, although in effect it institutes a ban on exploration and development (but not prospecting) until such time as there is a consensus among all key parties to the Convention that these activities may be considered in a specific area.

Rather than to promote minerals activities, the Convention's more important purpose is to enhance peace in Antarctica and the stability of the Antarctic Treaty System (ATS)--the collection of agreements regulating Antarctica--by making it more difficult for conflicts over mineral resources to occur. It was negotiated because minerals activities could become a source of conflict, and the parties to the Antarctic Treaty believed that concluding an agreement *before* any significant minerals discovery is made would be far easier than trying to do so after a major discovery. It was understood that a major discovery in the absence of an agreed regulatory structure might lead to the unraveling of the otherwise beneficial Antarctic Treaty System.

The Minerals Convention--Some Details

The Convention, although it is only a framework, contains some stringent controls on minerals activities. As general principles, no activity may take place unless the parties agree that scientific information is adequate to make informed judgments, that proposed activities will not result in any significant environmental impacts, that technology and procedures are available for safe operations and for compliance with environmental regulations, and that the capacity exists to respond effectively to accidents. Opening an area to consideration for exploration and development must specifically be approved by consensus of all key parties. Reaching consensus

among many diverse parties, some of whom are currently opposed to minerals development in Antarctica, is likely to be extremely difficult. If this hurdle is surmounted, additional hurdles a potential developer would have to clear before proposed minerals development could proceed are demanding. On balance, the Minerals Convention appears to be weighted more toward restricting development than assisting it. While some might desire regulations more favorable to industry, negotiation of a such a regime appears highly unlikely in the current political climate. The same might be said about those wishing regulations banning all minerals activities.

The environmental provisions of the Minerals Convention are stronger than those contained in any other Antarctic agreement. The Convention provides for inspection of all minerals activities and, in an important improvement over other ATS agreements, establishes regulations for compliance and enforcement of its provisions. Significantly, all disputes concerning compliance with the Convention's provisions and protection of the environment are subject to binding dispute settlement.

While the environmental requirements and sanctions of the Minerals Convention establish a potentially strong environmental framework, there are some open issues. For example, the Convention leaves out details that will need to be elaborated by the institutions established by the Convention. What, for instance, do terms such as "adequate" and "significant" mean in relation to environmental measures? Also, it is difficult to predict how well the compliance and enforcement provisions of the Convention will work in

practice, particularly since these are powers normally reserved by sovereign states, and issues affecting the status of claims in Antarctica have always been sensitive.

Implementing Legislation: If the United States does ratify the Minerals Convention and it enters into force, a next or concurrent step would be to enact domestic legislation implementing the Convention. Such legislation could provide general guidelines to the Administration, as did legislation implementing the Convention on the Conservation of Antarctic Marine Living Resources, or specific and detailed guidelines. At minimum, Congress will want to consider which agency or agencies to assign responsibilities for matters relating to Antarctic minerals activities; what activities will and will not be acceptable for U.S. citizens; what criteria and procedures will govern the acceptability of applications to undertake minerals activities and of environmental impact assessments; what data and information will be required so Federal agencies can carry out their assigned responsibilities; and how to enforce the regulations established in the legislation. Congress must also address interim liability measures governing prospecting, since this activity could commence as soon as the Convention enters into force. Although general liability provisions governing all minerals activities are contained in the Minerals Convention, a separate, more detailed liability protocol must be negotiated before *any* exploration and development could be allowed.

An Alternative to the Minerals Convention

An alternative to the Minerals Convention advanced by some is a "permanent ban" on all minerals activities throughout the continent, possibly by formally designating Antarctica a world park or wilderness reserve. While such a proposal has obvious appeal, it is not clear that it would be accepted by all the key stakeholders in Antarctica, and it may not necessarily meet the stated objectives of its proponents.

A ban would be difficult to achieve because a large majority of the Antarctic Treaty Parties support the Minerals Convention, even if they do not necessarily support minerals activities in Antarctica at this time. Instituting a ban and/or creating a formal park would require a consensus of the 25 current Consultative Parties, requiring most of these Parties to change positions they held during the long and extensive past negotiations.

Even if it were accepted, a "permanent ban" would not necessarily meet all of its proponent's objectives because it could be lifted by a consensus of the ATCPs. This consensus is little different from the similar consensus that would be required under the Minerals Convention to consider exploration and development. (A permanent ban might cover prospecting too, however, whereas under the Minerals Convention, prospecting is not subject to a consensus vote.) The most likely circumstances under which a ban might be lifted are during a period when there is more pressure to develop minerals and/or after a major discovery has been made (e.g., by scientists doing geological research). At that time, it may not be possible to negotiate an agreement with environmental provisions as strong as those in the Minerals Convention.

It is arguable whether a permanent ban is in the long-term interest of the United States. U.S. companies, like those in other countries, would be interested in Antarctic resource development if profits could be made. Economic development would not be easy in Antarctica, but it may eventually be possible in some cases. Moreover, the United States may not want to rule out permanently development that can be undertaken without significantly affecting the environment. While it may never be desirable to carry out resource development in some areas of Antarctica, in other areas, and for certain deposits, environmental impacts may be no more significant than impacts at some existing research bases.

Some have suggested that the ATCPs consider a moratorium on Antarctic minerals activities. A moratorium might either be considered in place of the Minerals Convention or coupled with it. If considered in place of the Convention, a moratorium is similar to a ban. Even if it were supported, it could probably be lifted at any time consensus to do so can be reached. If coupled with the Convention, the practical effect of a moratorium would be to stop near-term prospecting. Exploration and development would not be allowed under the Convention alone without consensus, and, as noted previously, such activities are not expected soon even under favorable circumstances. If a moratorium were created, ATCPs would probably want to try to ensure that prospecting did not continue under the guise of scientific research. (The same environmental provisions that apply to exploration and development under the Minerals Convention apply to prospecting, but de facto prospecting labeled as scientific research would be largely unregulated under a ban or moratorium).

If the Convention does not enter into force, the most likely result will be a continuation of an uncertain regime while countries seek a new compromise. It may even be possible that some country would consider itself no longer bound by the current agreement to refrain from minerals activities pending timely entry into force of the Convention and thus attempt to proceed with some minerals projects. There is a possibility that such a course of action could lead to the breakdown of the Antarctic Treaty System. Of particular concern, given claims uncertainties, could be any minerals activities in the Antarctic Peninsula, an area jointly claimed by Chile, Argentina, and the United Kingdom.

Some who oppose ratification of the Minerals Convention do so in large part because they are philosophically opposed to any minerals activity in Antarctica and believe that once a regulatory structure is in place minerals activities will be encouraged. Another view, however, is that only the successes of science and technology may foster minerals activity. As scientists have learned more about Antarctica, the possibility that an important resource discovery will be made has increased. As technology advances for resource development in other parts of the world, the feasibility of developing Antarctica's resources has also increased. On the other hand, some would argue that advances in the technology of low-grade resource recovery in other parts of the world could lessen pressures on Antarctica.

The Minerals Convention is not completely satisfactory to either commercial or environmental interests (which may be an indication of its balance). In the long run, however, issues of concern to these groups may be

secondary, so long as the political stability of the region is maintained--enabling the continent to remain demilitarized and preserving unhindered scientific research.

Prospects of the Minerals Convention Entering into Force

Initially, prospects for entry into force of the Minerals Convention appeared good since the Convention was adopted unanimously (on June 2, 1988) by those who negotiated it over a 7-year period. To enter into force, however, the Convention requires ratification by 16 of the 20 Consultative Parties that participated in the final session--and must include all seven claimants, the United States, and the Soviet Union. So long as any one of these nine countries chooses not to become a party to the agreement, it will not go into effect. Australia and France have now indicated they do not intend to ratify the Convention. Nevertheless, there is no deadline on ratification, and countries will be considering (and possibly reconsidering) the Convention's merits over the next several years.

As long as progress toward ratification of the Minerals Convention is perceived as being made, the parties to the Convention probably will refrain from undertaking any minerals activities (as agreed in the Final Act of the Convention). The Convention cannot be said to be defeated until such time as further progress is considered to be impossible. At that time, the voluntary restraint policy will no longer apply. Unless it is extended or an acceptable alternative regime is negotiated, countries will be free to proceed with minerals activities, subject only to their national laws. In sum, a good deal

more debate and negotiating will likely take place before the fate of the Minerals Convention is determined, and current prospects for its entry into force are uncertain.

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Mr. TORRICELLI. Thank you, Mr. Johnson.

Have any of the nations who now have sovereign claims in Antarctica announced opposition to the concept of an international park, or is the potential of that opposition from other signatories?

Mr. JOHNSON. I am probably not familiar enough with current events to answer that question correctly.

Mr. TORRICELLI. You raised it in your testimony, so I thought I would develop it.

Mr. JOHNSON. My assumption, though, is that there are not countries who currently oppose it, but that it will be a long and difficult negotiation to get all countries together to——

Mr. TORRICELLI. You didn't have any one, or a series of countries in mind when you made that comment, did you?

Mr. JOHNSON. No.

Mr. TORRICELLI. Are there any discoveries of minerals or materials in Antarctica that rise to the level of being commercially viable with technologies likely to be available in the near future?

Mr. JOHNSON. Certainly there is the possibility that a discovery would lead to economic development. What we don't know is whether or not there are world class resources, or reserves, that would be discovered in the future. Not enough work has been done to establish whether or not either a large oil deposit exists there, or a very high grade ore deposit.

Mr. TORRICELLI. But at this moment, there are no known minerals or materials that have been discovered or are suspected, even suspected, of such quantities or location that with currently available technology, or that technology likely to be available in the near future, that they rise to commercial potential?

Mr. JOHNSON. From all the information we have, there are no such discoveries.

Mr. TORRICELLI. Under any of the contingencies that I just suggested to you?

Mr. JOHNSON. Under any of those contingencies.

Mr. TORRICELLI. Assuming appropriate changes in either market forces or the technology of recovery in the foreseeable future, what minerals would you suggest are most likely to be found in commercial quantities?

Mr. JOHNSON. Well, the evidence that we have found, and we have some hypothetical scenarios in our report that was published, is that supergiant oil fields, perhaps in the Ross Sea region, could lead to commercial exploitation if they were large enough and if there were located in regions that allowed reasonable exploitation. That is, if they allowed us to use fairly well-developed technology that has been used in other regions of the world like the North Sea.

Mr. TORRICELLI. The Ross Sea area, meaning areas that experience ice breakup and thaw?

Mr. JOHNSON. Yes. And also on the Antarctic peninsula, if there were discoveries of some minerals such as gold and copper in sufficiently high-grade deposits——

Mr. TORRICELLI. Are you pursuing a line of thinking based on some operating scientific theory, or just postulating?

Mr. JOHNSON. There has been some indication that if one were to spend enough time and effort in prospecting and in exploration, some deposits like these might be discovered.

Mr. TORRICELLI. Both on the oil and the minerals?

Mr. JOHNSON. Yes. Therefore, we looked into the hypothetical question of whether someone could produce such deposits. It does not appear that technology itself is a severe limitation, if you confine yourself to some of the more benign regions.

Mr. TORRICELLI. So the principals barriers, then, are political and economic?

Mr. JOHNSON. Political, economic, environmental, yes.

Mr. TORRICELLI. Do you foresee the economic barriers, given the technology of recovery and the market costs, the market prices of some of the things we are discussing, changing in the near future?

Mr. JOHNSON. Not in the near future, but if one were to look a few decades ahead, certainly it is very difficult to postulate what those economics might be. That is probably what would govern.

Mr. TORRICELLI. Are you aware of any nations or companies that are engaged in serious prospecting at this moment, either for oil or the minerals that you cited?

Mr. JOHNSON. No. We are aware of some past work that has been done, in particular seismic work on some of the offshore areas, very general reconnaissance work and seismics that might lead to some indication of oil reserves. But we are not aware of very serious, direct prospecting work.

Mr. TORRICELLI. Some have suggested that it could be 30 years before the technical capabilities are at hand to exploit world class deposits of minerals. Is that an estimation you think is reasonable?

Mr. JOHNSON. I think 30 years is reasonable, given all of the considerations, the economic, environmental and technical. I think the technical is the least of those.

Mr. TORRICELLI. Thank you, Mr. Johnson.

Mr. Campbell, since Mr. Valentine is co-hosting this, and is a co-chairman, I was going to ask him to ask questions next.

Mr. VALENTINE. Thank you, Mr. Chairman. I will be brief.

I just have one or two questions I wanted to ask. I have had the opportunity, about two and a half years ago, to visit this part of the world, and it was an experience which I will never forget. I think if one has the opportunity to visit Antarctica, one can review matters pertaining to that continent with special meaning.

It was not clear to me, Mr. Johnson, what you said with respect to the technical problems that could or could not be overcome. It seems to me—and I don't want anybody to get the impression by these questions that I think we should do any of these things, because I for one believe that this part of the world should be left alone, left as it is, become a park, or whatever.

But when it comes to the extraction of the treasures of the earth on that continent, if you are talking about things like oil and natural gas, it seems to me that that is an entirely different situation than an effort to extract from that terrain, minerals. It seems to me that that would be a practically impossible situation to bore down, to penetrate the ice, and get down to where the minerals are, and to arrange to get them out.

What do you think about that? Isn't that a situation that just boggles the imagination?

Mr. JOHNSON. Yes, in terms of 98 percent of the continent that was covered by ice. I was addressing the possibility of, or possible future, exploitation of minerals probably only in those regions that are exposed along the Antarctic peninsula, places where it would be a lot more accessible, at least in some seasons of the year.

One of the reasons that one can make that statement is that there are currently a number of Arctic mining operations in existence today, in the high Arctic, that have overcome some of the environmental problems that minerals operations would face—not in the interior of Antarctica by any means, but on the fringes.

Mr. VALENTINE. If this organization, CRAMRA, is not ratified, what is the alternative? What do we have then?

Mr. JOHNSON. I believe what we have is a continuation of negotiations around some other proposals. The one concern about that is that it may at some time in the future leave the possibility of an unregulated regime in Antarctica.

Mr. VALENTINE. Can you tell us if there is, to your knowledge, any serious agitation in any country to make a meaningful effort to extract from that continent these natural resources?

Mr. JOHNSON. I do not have full knowledge of all that is going on in that regard, but I am not aware of any serious activity myself, of any work that we have done.

Mr. VALENTINE. If the continent is subject to this type of exploitation, would not the influx of people necessary to run the apparatus in itself cause special problems that it would be very difficult to deal with?

Mr. JOHNSON. Certainly, logistics is one of the major costs and problems with operating in Antarctica. And of course, the transportation of materials, both in and out of any mining or minerals operation, would be a substantial increase in human activity there, with all of the subsequent environmental effects.

Mr. VALENTINE. Thank you, sir.

Mr. TORRICELLI. Mr. Campbell?

Mr. CAMPBELL. Thank you, Mr. Chairman.

Mr. Johnson, I very much appreciate your testimony, and I have a couple of questions so that I may understand it better.

The first deals with mineral exploration. Does the treaty—I simply don't know the answer—does the treaty deal with krill and the potential value of that resource within the Antarctic convergence, the harvesting of the planktonous krill population?

Mr. JOHNSON. No, it does not. That is the subject of a previous convention on living marine resources. That has been negotiated and is in effect at the present time.

Mr. CAMPBELL. Thank you, I appreciate the clarification. On the petroleum question, you said that it would take a doubling of the price of oil to make it economically worth discussing? I take it that was your testimony. If that is right, it strikes me as something which is not beyond the realm of possibility. The price of petroleum is about $19 a barrel right now. We have had petroleum up above $40 a barrel.

Did I read you right, if petroleum was at $38 a barrel, we would go in, and it would be economically desirable to do so?

Mr. JOHNSON. Let me preface that by saying that we have no knowledge of such a deposit. But if, for example, a supergiant field were located in some reasonably accessible area around the Antarctic, in the ocean, and the prices were about double today, then it appears that economics would be as significant a factor.

But that requires a very large oil deposit, very high grade and quality of production, which is not found very often anywhere in the world—like a Prudhoe Bay.

Mr. CAMPBELL. I was about to ask, isn't that a fascinating comparison? It's like the one we found in the Arctic.

Mr. JOHNSON. Yes.

Mr. CAMPBELL. That doesn't do very much for my reassurance.

Pursuing that, what percentage of "potentially available" as you said has to be available, so not underneath the glacier, but what percentage of the potentially available space that might contain an oil deposit of this size has been subject to the seismic studies to suggest that potential of petroleum formations?

Mr. JOHNSON. Maybe Mr. Mielke would like to answer that.

Mr. CAMPBELL. I bet very little. But tell me if you know differently.

Mr. MIELKE. That's correct. The seismic lines that have been run are very widely spaced. That are not what you would call exploration at all. They are really reconnaissance, and that is just to get a sense of what the sediment basins are like, how deep the sediment is, and possibly whether or not it could have reached a stage where petroleum would even form. Some basins have been identified by seismic, but not well enough to identify whether or not they would even contain petroleum.

Mr. CAMPBELL. The point to which I am heading is this, then, correct me if it is incorrectly stated.

We have simply not explored enough to know if a Prudhoe Bay type reserve of petroleum might be there.

Mr. MIELKE. That is correct.

Mr. CAMPBELL. If the economics indicated a price of petroleum at $38 a barrel, which is well within the realm of possibility, even in the middle distant future, it would become economically feasible to undertake that sort of exploration?

Mr. MIELKE. That type of exploration is exceedingly expensive in such a region as Antarctica. That is one reason why the price of oil would have to be sufficiently high to make it economically attractive. In addition to that, the costs of production of oil down there are also exceedingly expensive.

Mr. CAMPBELL. Let me, if I may, distinguish those two. The cost of production I completely understand, and I do not have anything like your kind of background, so please forgive me. But I don't see why the cost of doing the seismic study is particularly great, unless it is because of weather conditions.

Mr. MIELKE. Weather conditions, yes, and also the cost of travel just to get down there to run seismic lines.

Mr. CAMPBELL. The conclusion I draw, if you don't mind, is that is not much of an inhibition. If petroleum goes up to $40 a barrel, there will be people and companies looking to drill in Antarctica. Can you disabuse me of that?

Mr. JOHNSON. Just one additional factor, though—seismic exploration is just one part of that exploration program. The costly part of it is drilling, exploratory drilling. That is very costly, and before that is done, we still have no real indication of the existence of any sizable deposits.

Mr. CAMPBELL. But that would be indicated by seismology? That would be the first step?

Mr. JOHNSON. Yes, but such an initial step that no commercial firm would invest any sum of money in it before they had some drilling done. Drilling is very expensive, and in Antarctica the drilling would need to be done on very virgin territory, where very little is known at all about the subsurface geology except from these indirect and widely spaced means. So someone might invest in a drilling program that is completely off of any region that might have possibilities.

It is a huge area, an area that is larger than the United States. In comparison to the U.S. Arctic, for instance, U.S. oil companies have been looking at the offshore regions of the Beaufort Sea and the Chukchi Sea over the last 10 years or so, and there have been no discoveries of significance there to make them economically viable, even though they are right next to Prudhoe Bay, and a lot is known about the geology there.

Mr. CAMPBELL. I would like to sum up if I may, because it seems to me that you were giving me one indication, then you might be withdrawing a little bit from it, and I don't wish to characterize your testimony that way, if it is not fair.

If the price of petroleum goes to, let us say, $40 a barrel, is it your prediction that unless there is some law preventing it, whether it is a treaty or United States domestic law, oil companies will explore for petroleum in the Antarctic? Can you give me a prediction? What do you think?

Mr. JOHNSON. That is very difficult to say, and that is probably why we are hedging on it. There are a lot of considerations that an oil company would face, not the least of which is where to put their resources for exploration. If there are other places in the world that look more promising and more politically stable, they would not invest in Antarctica; they would invest there. And there are some other places at the present time.

Mr. CAMPBELL. All right, thanks. I will ask one other line of questions. And I understand why you may not be able to answer as though you were under cross-examination, and I don't intend that.

Dealing with the development of colonies, I am concerned about the environmental consequences of colonization. I understand that the Chileans have already begun some colonization on the Antarctic peninsula. That has some environmental consequences from the solid waste disposal, from the normal pollution that comes from the servicing them. Does the Mineral Convention deal at all with the colonization phenomenon?

Mr. JOHNSON. In a very general way, in setting environmental guidelines for all activities, it would. But not specifically.

Mr. CAMPBELL. And is there any other regime governing Antarctica that does deal with colonization, specifically limits on colonization?

Mr. JOHNSON. I am not aware of any.

Mr. CAMPBELL. I am not either, that's truly why I was asking. The only other treaty I know of is a 1959 treaty, and that does not prohibit it.

That concerns me greatly, both those points. I thank the two Chairs.

Mr. TORRICELLI. Mrs. Morella.

Mrs. MORELLA. Thank you, Mr. Chairman. I find reading your testimony and the line of questioning fascinating. I want to ask you first of all, is there any kind of a time frame for the ratification of the treaty?

Mr. JOHNSON. There is no deadline for the ratification of the treaty. However, as I understand the agreement that the parties are conscientiously moving in the direction of ratification, that's what has been agreed to.

Mrs. MORELLA. So it could go on continually, ad infinitum, really, because there is no time frame on it.

Speaking of time, and plans, and mineral exploration of this wonderful continent, what about environmental considerations? I am wondering, are we not looking at the possibility of mining prematurely? Do we know enough about atmospheric changes and possibilities to go into trying to get this Convention approved?

Tell me, environmentally, what position we are in.

Mr. JOHNSON. Certainly, the Convention precedes our knowledge about what might be done there, what activities might take place, and how they might take place. The rationale for doing that is to establish a framework for regulation of those activities before we really know very much about what they might be.

Mrs. MORELLA. So it is pretty premature, isn't it?

Mr. JOHNSON. From that standpoint, it may be premature. On the other hand, no one can predict the future. There may be activities that will occur sometime in the next several decades or so, and the rationale is to have a framework for environmental protection in place before that might occur. That has some merit because, if the nations that might sponsor activities are bound by this regulatory regime, they would hesitate to go off and do something outside of such a regime.

Mrs. MORELLA. It sounds a little convoluted in a way, in that it might be that procedures for mining and exploration, maybe the two countries that have held back, Australia and France, decide they will sign a Convention, and then we move ahead, then suddenly we discover that there is an adverse environmental impact. That may be irretrievable. It may be too late.

Is that a possibility, or a problem?

Mr. JOHNSON. Not necessarily. The Convention itself allows for the development of specific regulations for any of those activities. It is a framework, it is not a set of regulations in itself. It establishes bodies that would evaluate anybody's proposal to do exploration of development, and those bodies would then make a decision on whether to permit it. That decision would necessarily be a consensus among all the parties.

But exactly what those regulations would be are yet to be determined. Except for the fact that the parties at interest have agreed that they will all consider them and abide by certain guidelines

and make decisions on a consensus basis, when those proposals are brought forth to them.

Mrs. MORELLA. It also sounds like you are thinking about a long way into the future before there is any ratification. Are we talking about multi-years? Is there exploration and experimentation in the meantime? And what do you think about this being a protected area? Do you veto that completely?

Mr. JOHNSON. No, not at all. I think the question is not whether the area would be protected enough under a different regime, but whether this Convention itself offers significant protection for the environment. That's debatable. There are concerns about the Convention; however, the Convention itself does have a focus on protecting the environment.

Mrs. MORELLA. I appreciate your candor in also saying that the protections are debatable. I thank you very much, and I thank you, Mr. Chairman.

Mr. TORRICELLI. Thank you, Mrs. Morella.

In testimony we are going to receive later, Mr. Johnson, it is suggested that in the vacuum that might be created by failure to act on the ratification, or rejection, a legal environment may be created that severely hampers scientific research. Is that among your concerns, and what kinds of action that might follow—if that is your concern—do you consider damaging to legitimate scientific inquiries that are important?

Mr. JOHNSON. In the work that we have done, I don't see any concern about legitimate scientific pursuits.

Mr. TORRICELLI. So you don't think if this fails, and our enthusiasm flags otherwise to protect Antarctica, that there is a legislative environment or specific initiative being suggested that would hamper important scientific work?

Mr. JOHNSON. No, that's not my impression. I think the more important consideration is environmental protection and whether or not the Convention or some alternative would be a better route.

Mr. TORRICELLI. Mr. Mielke, just to return to the oil question one final time, I understand that, while core samples have indicated that there might be oil, there is no evidence of the kind of porous rock, no evidence whatsoever of porous rock, that would indicate the possibility of large-scale deposits. And have there been enough samplings from a geologist's point of view to actually reach that conclusion?

Mr. MIELKE. There was one core taken in 1986, I believe, in the Ross Sea, that showed signs of asphalt, indicating that petroleum products had formed and was no longer there. Other than that, some scientific research drilling found traces of gas. This is probably not significant as an indicator of a petroleum or gas deposit. As to the nature of the sediment, you really need a deep core to get a better idea of the character of the sediment in some of these basins, and as to whether or not petroleum might have formed.

But that type of work has not been done.

Mr. TORRICELLI. So you would not reach any conclusion about the potential either way?

Mr. MIELKE. I would not. There is another line of geological reasoning that might indicate whether or not petroleum is likely, and that is by kind of reconstructing Antarctica back into Gondwana-

land, as it is called in ancient history, a continent or mass that was connected to surrounding continental areas, such as are now in Africa, South America and Australia.

Looking at the petroleum provinces in those areas, one could assess them as not being major prolific petroleum producing areas, and from that might conclude that the prospects for finding a huge Prudhoe Bay type deposit in Antarctica might be somewhat more diminished.

Mr. TORRICELLI. Gentlemen, thank you very much for your testimony. The committee appreciates it.

The committee will now hear from Curtis Bohlen, the Assistant Secretary of State, Department of State. Mr. Bohlen is accompanied by Peter Wilkniss, Director, Division of Polar Programs, National Science Foundation.

Mr. Secretary, Mr. Wilkniss, welcome. As we communicated earlier, of course, your testimony will be submitted for the record in its entirety. We would appreciate it, however, if you would provide a summary or present your views as you deem appropriate.

Please proceed.

STATEMENT OF HON. CURTIS BOHLEN, ASSISTANT SECRETARY OF STATE FOR OES, DEPARTMENT OF STATE

Mr. BOHLEN. Thank you, Mr. Chairman. I think my prepared statement contains quite a bit of background information on U.S. interests in Antarctica. However, I assume that much of this information is known to the people in this room, and what you are really interested in discussing today is the posture that the United States will take in relation to the Minerals Convention as we prepare for the meeting of the Antarctic parties in Santiago, Chile, next November.

I would like to get directly to that point. Before I do, I should set the context of what we are talking about. Mr. Chairman, as you well know, Antarctica and the Antarctic treaty are very important to the United States. I think we all probably agree on why they are important. The Antarctic treaty and the system that is developed under it has kept its promise of maintaining Antarctica as a place of peace and international cooperation for nearly 30 years now.

This remarkable cooperative legal regime of nations has worked and has proved to be resilient, as it has met the challenges that it faces. Its consensus process occasionally makes the system unwieldy, but consensus is they key, because it ensures that national interests can be accommodated within the cooperative international system.

The continent itself is important to us. It is a place that is available for scientific research. There we can learn about the global environmental systems without the direct polluting effects of civilized society. It is a place that provides us with a benchmark from which to monitor changes in global environmental systems. It is a place that itself affects those systems.

It is a place, as you know, of stark beauty and magnificent wildlife that capture our attention. It also may be a storehouse of resources that mankind may need in the future. The United States has been a leader in Antarctica; we have been a leader within the

treaty system; and we are a leader in scientific research and environmental protection on the continent.

Mr. Chairman, this is the context in which we must consider our approach to the Santiago meeting. As you know, about eight years ago, the consulting parties began to discuss and negotiate a minerals resources convention. There were several reasons why they began in that time. There was environmental concern to be sure, but more importantly, following the oil crisis of the 1970s, there was growing interest in exploring oil and gas potential in Antarctica. This, of course, raised the specter of the sovereignty claims. States claiming sovereignty in Antarctica naturally insisted on control over mineral activities in their claimed areas, even exploration.

In countries like the United States, we do not recognize these claims, and likewise insisted that, if a U.S. geophysical survey ship wanted to engage in some prospecting in Ata, it had a perfect right to do so. There was a potential confrontation here, apparent to all the consulting parties. It is the strength of the Antarctic treaty system that the consulting parties can recognize potential problems and set about doing something about them.

And so it was that, through a series of recommendations, the consulting parties agreed to a non-binding moratorium on minerals activities, while negotiations proceeded on the Minerals Convention. The result of those negotiations is now before us, and I understand that some have raised objections.

Mr. Chairman, the crux of what I have to say to you today is this. We are mindful of the objections that have been raised, and we are willing to seek ways to overcome them. At the same time, in a spirit of cooperation that has characterized Antarctica, I hope that those that have raised these objections will consider most carefully their position and work with us to find a way to preserve the minerals treaty.

As I understand it, most of the expressed objections are not to the Convention per se, but more to the fear that the Convention will cause a land rush mentality and damage the pristine Antarctic environment. The Antarctic Minerals Convention is a good convention. It contains perhaps the strongest principles on environmental protection that have ever been negotiated. We don't want to lose it.

I recognize that oil and gas activity or other minerals activity in Antarctica are possible scenarios that many people presently oppose. They may be right to do so. But the standards of the Convention are very rigorous, whether they could ever be met is an open question. But what we can predict is that if economic or political pressures develop within any country to the point that minerals activity within Antarctica became a matter of high importance for that party, the environmental interests will be best protected if this minerals treaty is in force as the agreed international mechanism to determine if minerals activity should be allowed.

As you know, the Convention requires that if any single country wishes to engage in minerals exploration activities, the whole group—every key party—would have to agree that the proposed area could be opened up. That is a tough rule. Mr. Chairman, I am concerned that those opposed to the minerals treaty are not look-

ing at these details, and we are about to throw the baby out with the bath water.

The international reality is that, if we can't bring the minerals treaty into force, we could have a legal vacuum. There will be no agreed regime to control the activities of the inevitable prospectors. There will be no agreed regime through which the consulting parties can exercise a collective will of control over activities that restrain the treaty system and risk environmental damage.

We need the mineral treaty. Without it, we will have a chaotic situation where nations in response to pressures from developmental interests will begin to determine unilateral approaches to Antarctica. That is not the way we have kept the system together for 30 years. It is not the way to go now. I hope that those who are opposed to the minerals treaty will reexamine their position in this light.

At the same time, the Administration is quite prepared to listen to, to work with, and to try to accommodate, many of the concerns which have given rise to the present opposition. I am not presently in a position to go into details about the kinds of solutions that may be possible. But I can say we have heard the concerns, and we recognize the need to find a solution to achieve support for the Minerals Convention. We are prepared to work with the Congress and with the various interest groups to achieve a solution we can all support.

Over the next two to three months, we will be engaged in a series of consultations with our consultative party partners who appear to hold a variety of positions in this matter, and we will be working with and listening to the Congress and the public. We will also be continuing our work in consultations on developing a comprehensive, legally binding framework for environmental protection in Antarctica. This will be the paramount subject of the upcoming Chile meeting.

We are committed to finding within the Antarctic treaty system a new and more enforceable mechanism for fully protecting the unique landscape of Antarctica and its associated ecosystems, one that will augment and strengthen all the present conventions.

I only ask that you keep in mind that, if we are to do the right thing for Antarctica, we must remind ourselves that we can't do it alone. We need to do it by developing a consensus within the Antarctic treaty system. Please work with us, and I pledge that we will work with you.

Thank you.

[The prepared statement of Mr. Bohlen follows:]

TESTIMONY OF
CURTIS BOHLEN,
ASSISTANT SECRETARY OF
STATE FOR OCEANS AND INTERNATIONAL
ENVIRONMENTAL AND SCIENTIFIC
AFFAIRS, BEFORE THE COMMITTEE
ON SCIENCE, SPACE, AND
TECHNOLOGY, U.S. HOUSE
OF REPRESENTATIVES
JULY 12, 1990

I am pleased to appear before this joint hearing of the the Subcommittee on Transportation, Aviation and Materials and the Subcommittee on Science, Research and Technology to address United States policy with respect to Antarctica, and protection of the Antarctic environment, including the Convention on the Regulation of Antarctic Mineral Resource Activities.

The United States plays a pre-eminent role in the important scientific research that is the primary human activity in Antarctica and in the ongoing development of

international obligations to protect the Antarctic environment within the Antarctic Treaty system. In this regard, I would like to emphasize the Administration's commitment to seek a new and more comprehensive approach to protecting the Antarctic environment. Such an approach would be in addition to the Convention on the Regulation of Antarctic Mineral Resource Activities (the Antarctic Minerals Convention), which is itself an important mechanism for the protection of the Antarctic environment.

Let me begin with several general remarks about U.S. Antarctic policy. This policy rests upon three fundamental and inter-linked objectives: protection of the Antarctic environment and the continent's associated ecosystems; ensuring that human activities in Antarctica do not adversely impact the environment or reduce the opportunities in this unique environment to study and learn about natural processes of global significance; and maintaining Antarctica as a zone of peace, reserved exclusively for peaceful purposes.

The Antarctic Treaty and Antarctic Treaty System

Achievement of these objectives, particularly in light of differences among nations over the existence of territorial sovereignty in Antarctica, requires an agreed international legal framework. This framework is provided by a uniquely successful international agreement - the Antarctic Treaty - which entered into force in 1961. The Treaty places

on a permanent basis the system of peaceful international cooperation in Antarctica which evolved during the International Geophysical Year of 1957-58. It guarantees freedom of scientific research in Antarctica and establishes the basis for international cooperation therein; reserves Antarctica for peaceful purposes only, prohibiting all military activities, nuclear explosions or disposal of radioactive waste there; and sets aside the questions of sovereignty in Antarctica.

A far-sighted document, the Antarctic Treaty also provides a mechanism for addressing new activities and circumstances through regular consultative meetings of its Parties. As a result of the operation of this consultative mechanism, an extensive network of measures and separate agreements have been elaborated, frequently known as the Antarctic Treaty system.

The Treaty system includes major agreements to conserve living species in Antarctica. The 1964 Agreed Measures for the Conservation of Antarctic Fauna and Flora prohibit the taking of plants, birds and marine mammals native to the continent except for scientific purposes and establish a system of specially protected areas in which human access is strictly limited. The 1972 Convention on the Conservation of Antarctic Seals provides a means for protecting seal populations from harvesting at sea.

The 1980 Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR) applies an innovative ecosystem approach to conservation. CCAMLR Parties (twenty-six nations and the European Community) have made significant progress in understanding the interrelationships and population dynamics of the species found in Antarctic waters and in their protection and conservation. They have placed major restrictions upon commercial fisheries, including catch quotas, gear regulations and area and seasonal closures, as well as a system of inspection of fishing vessels at sea.

The Convention on the Regulation of Antarctic Mineral Resources (Antarctic Minerals Convention) is the most recent convention negotiated under the Antarctic Treaty.

The Antarctic Minerals Convention

The United States and the other Antarctic Treaty Consultative Parties (ATCPs), adopted the Antarctic Minerals Convention by consensus on June 2, 1988. Adoption of the Convention, following a five-week conference in Wellington, New Zealand, brought to successful conclusion six years of negotiation. The Convention was open for signature for a period of one year beginning on November 25, 1988. The United States signed on November 30, 1988.

Ratification by sixteen of the twenty ATCPs that were

ATCPs when the Convention was adopted is required for the Convention to enter into force. The sixteen must include Argentina, Australia, Chile, France, New Zealand, Norway, the U.K., (claimant states), as well as the U.S., and the U.S.S.R.

The Antarctic Minerals Convention establishes an agreed international process for determining whether mineral resource activities should ever take place in Antarctica, if interest in minerals development were to emerge in the future, and for regulating any activities determined to be acceptable. It does not open Antarctica to mining, or the development of oil resources, nor does it presume that mining or oil extraction definitely will take place. The Convention would prohibit exploration and development in any area of Antarctica unless there is first a consensus of all decision-making Parties that such activities could accord with its standards and procedures. If the United States, or another Convention Party does not agree to identify an area for exploration or development, it cannot happen.

The Convention is of necessity a framework agreement, since it is not known if and when commercial interest in Antarctic mineral resource activities might emerge, which minerals might be the object of such interest, or in which areas of Antarctica they might exist. It does not articulate detailed rules and regulations to be applied to possible Antarctic mineral resource exploration and development activities. Rather, it prescribes the principles and criteria,

upon which decisions about mineral resource activities must be based; and provides for the institutions (including their composition, functions and decision-making procedures) for administering and overseeing this process. These institutions include a Commission, with general regulatory authority; Regulatory Committees, with specific responsibilities for particular geographic areas; and a scientific technical and environmental advisory body.

The Convention sets forth stringent substantive principles of strict liability applicable to any mineral resource activities that might be determined acceptable. In addition, it calls for the negotiation of a separate protocol on liability to elaborate these principles and the mechanisms necessary to assess and adjudicate claims of damage, including environmental damage, and to ensure prompt and adequate compensation for any such damage. The liability protocol is to be negotiated by consensus and to enter into force on the same basis as the Antarctic Minerals Convention itself. No exploration or development activities under the Convention could be considered until the liability protocol is in force. At the Wellington conference at which the Convention was adopted, the ATCPs agreed that negotiations on the protocol should be initiated as soon as possible.

I believe it appropriate, at this point, to quote the full text of the provision of the Convention that articulates the basic standards binding upon all decisions about possible mineral resource activities in Antarctica:

Article 4

1. Decisions about Antarctic mineral resource activities shall be based upon information adequate to enable informed judgments to be made about their possible impacts and no such activities shall take place unless this information is available for decisions relevant to those activities.

2. No Antarctic mineral resource activity shall take place until it is judged, based upon assessment of its impacts on the Antarctic environment and dependent ecosystems, that the activity in question would not cause:

(a) significant adverse effects on air and water quality;

(b) significant changes in atmospheric, terrestrial or marine environments;

(c) significant changes in the distribution, abundance, or productivity of populations of species of fauna or flora;

(d) further jeopardy to endangered or threatened species or populations of such species; or

(e) degradation of, or substantial risk to, areas of special biological, scientific, historic, aesthetic, or wilderness significance."

3. No Antarctic mineral resource activity shall take place until it is judged, based upon assessment of its possible impacts, that the activity in question would not cause significant adverse effects on global or regional climate or weather patterns.

4. No Antarctic mineral resource activity shall take place until it is judged that:

(a) technology and procedures are available to provide for safe operations and compliance with paragraphs... above;

(b) there exists the capacity to monitor key environmental parameters and ecosystem components so as to identify any adverse effects of such activity and to provide for the modification of operating procedures as may be necessary in the light of the results of monitoring or increased knowledge of the Antarctic environment or dependent or associated ecosystems; and

(c) there exists the capacity to respond effectively to accidents, particularly those with potential environmental effects.

5. The judgments referred to in paragraphs 2, 3 and 4 above shall take into account the cumulative impacts of possible Antarctic mineral resource activities both by themselves and in combination with other such activities and other uses of Antarctica.

As mentioned earlier, all members of the Commission would have to agree that these standards have been met before any area of Antarctica could be identified for possible exploration and development activities.

The United States Position

In deciding to sign the Convention, the United States concluded that the Antarctic Minerals Convention represents the most balanced and environmentally sound framework that could be achieved to deal with possible mineral resource activities in Antarctica.

From the political perspective, the United States objective was the preservation of the principles and purposes of the Antarctic Treaty which has made Antarctica an effective zone of peace reserved exclusively for peaceful purposes. In our view, entry into force of the Convention will ensure that questions relating to mineral resources will be treated in accordance with these principles and purposes and will not become the object of international dispute or conflict.

From the environmental perspective, the United States objective was to ensure the protection of the Antarctic environment. The Convention, in our view, is a landmark in the evolution of international environmental law and its environmental provisions are unique in their rigor and content. The Convention prohibits all exploration and development until they are agreed to by all decision-making Parties, and it requires that no such activities take place unless this information is available for decisions relevant to those activities.

From the economic perspective, the United States objective was to ensure that U.S. operators have the opportunity to seek, on a fair and non-discriminatory basis, to participate in any future mineral resource activities that all the Convention Parties determine to be acceptable. In our view, the Convention preserves this option.

Future of the Convention

Questions relating to the future of the Antarctic Minerals Convention have been raised as a result of the announcement by Australia in May, 1989 that it had decided not to sign the Convention and would instead work for a permanent ban on all mining activities in Antarctica. Australia, joined by France, at the Fifteenth Antarctic Treaty Consultative Meeting (ATCM XV) in Paris, October 9-20, 1989, put forward a proposal for a comprehensive environmental convention including designation of Antarctica as a "natural reserve/land of science". Though the proposal did not specifically mention mineral resources, it was linked to Australia's call for a permanent ban on mineral resource activities in Antarctica.

The proposal for such a ban has not been widely supported among the Antarctic Treaty Consultative Parties (ATCPs). Seventeen of the twenty-five ATCPs have signed the Antarctic Minerals Convention (Argentina, Brazil, Chile, China, Finland, German Democratic Republic, Japan, Korea, New Zealand, Norway, Poland, South Africa, Sweden, U.K., U.S.S.R. and Uruguay, in addition to the United States). These Parties, at ATCM XV in Paris, opposed the Australian-French proposal for a comprehensive convention because, inter alia, it was seen as an effort to set aside or replace the Antarctic Minerals Convention. Belgium and Italy supported the proposal for a comprehensive convention, without addressing the question of a ban directly. (Belgium has enacted domestic legislation prohibiting Belgian nationals from undertaking mineral resource activities in Antarctica; the Italian Parliament has passed a non-binding resolution opposing the Antarctic Minerals Convention.) Recently we have also learned that New Zealand has decided to postpone further action on the ratification of the convention. The remaining ATCPs (the Federal Republic of Germany, India, Peru and Spain) have not taken a position.

We do not believe that unilateral legislation by any Party is the best way to determine whether Antarctic mineral resource activities should ever be acceptable. Without an international system as contained in the Antarctic Minerals Convention, there

would be real danger of damage to the political, as well as the physical, ecology of Antarctica in the event of emergence of interest in mineral resource activities there. Because national legislation can always be amended, it cannot be an effective substitute by itself.

The lack of support evidenced in Paris for the Australian proposal for a permanent ban was itself one indication that it is unlikely to achieve the necessary consensus of the ATCPs. For this reason, there is real concern that the Australian initiative could result in the lack of an agreed basis for determining the acceptability of mineral resource activities in Antarctica - neither the Convention nor an alternative - with the future possibility of unregulated or, at best, inadequately regulated activities.

With respect to the substantive workability of the Australian proposal for a ban, most ATCPs, including the United States, view the Antarctic Minerals Convention as a sounder basis for dealing with the possibility that commercial interest might emerge in the future. Two main reasons underlie this attitude.

First, the permanent ban would purport to decide for all time that mining in Antarctica could never take place in an environmentally acceptable fashion, regardless of future facts and circumstances. The Antarctic Minerals Convention provides that a determination of the acceptability of mining should be made only if and when interest in such activities emerge, in light of the facts and circumstances at the time and against

the rigorous environmental standards and procedures included in the Convention.

Second, if a consensus were to emerge that mineral resource activity should be considered in Antarctica - however unlikely hat event seems now - the Antarctic Minerals Convention would provide an agreed and rigorous process for structuring such consideration. It is not impossible to foresee circumstances where shortages of resources essential to industrial economies might generate political pressures for the lifting of a ban. These would be the worst circumstances in which to seek to negotiate a regime that would offer protection to the environment comparable to that provided by the Minerals Convention.

For these reasons, the Administration supports retention of the Convention, with its indefinite ban on mining activities, as the internationally agreed mechanism for determining whether mineral resource activities should ever take place in Antarctica. Equally, we are committed to avoiding a situation in which there is no internationally agreed system for dealing with interest in Antarctic mineral resource activities should interest in such activities ever materialize. Therefore, we are prepared to consider means of addressing the concerns which have been raised over the Convention. This would include a commitment to bring the Antarctic Minerals Convention into force as a "fail-safe" against the possibility that some day mineral resource

interests might be directed to Antarctica, coupled with provisions to ensure that such entry into force would not stimulate any rush to undertake mineral activities in Antarctca.

Comprehensive Measures for the Protection of the Antarctic Environment

The issue of comprehensive measures for the protection of the Antarctic environment was the most prominent item on the agenda of the Fifteenth Antarctic Treaty Consultative Meeting (ATCM XV) took place in Paris, October 9-20, 1989.

It generated considerable attention and some controversy as a result of the perception, noted above, that the French-Australian proposal for a comprehensive convention was primarily a device to replace the Antarctic Minerals Convention. The great majority of the ATCPs believed that new and comprehensive environmental measures should augment but not replace the extensive network of environmental protection provisions already elaborated within the Antarctic Treaty system, including the Antarctic Minerals Convention. At the same time, all Parties shared a commitment to the objective of a comprehensive system for the protection of the Antarctic environment, including initiation of work on liability issues.

Therefore, in spite of divergences over this item, convergence in view was also achieved on comprehensive measures and two consensus recommendations were adopted. The first

calls for the "further elaboration, maintenance and effective implementation of a comprehensive system for the protection of the Antarctic environment" and for a special meeting in 1990 to contribute to this objective. The second calls for a meeting, also in 1990, to initiate work in relation to the liability protocol called for in the Antarctic Minerals Convention. In each case, the meetings are to consider all proposals. The Government of Chile offered to host both meetings and has issued an invitation to convene them in Santiago in November.

In our view, the consensus achieved on the recommendations dealing with comprehensive measures augurs well for future progress. The recommendations outline a program of work (based on a U.S. working paper) that calls first for identification of the substantive elements of a comprehensive system and only thereafter for addressing the issue of form (e.g., convention, protocol or agreed measures). An approach of this sort, building upon the existing components of the Antarctic Treaty system, should lead to a successful result in the effort to be launched at the November meetings in Santiago.

The principal United States objectives for the Santiago meetings will be to develop a comprehensive system for protection of the Antarctic environment building upon the legal and institutional foundation offered by the Antarctic Treaty and the Antarctic Treaty system and to launch consideration of the liability protocol. They include retention of the Antarctic Minerals Convention as the best available mechanism for determining whether mineral development activities should ever take place in Antarctica.

The U.S. will seek agreement in Santiago not only to update and extend the body of measures governing activities in Antarctica but also to develop a more coherent and enforceable framework for implementing the agreed measures pursuant to the Treaty.

Specific elements of this approach include:

o negotiation by the Parties to the Antarctic Treaty of a framework approach under the Antarctic Treaty system, designed to extend and improve its effectiveness as a mechanism for ensuring the protection of the Antarctic environment, and including:

a) the premise that the Convention for the Conservation of Antarctic Seals, the Convention on the Conservation of Antarctic Marine Living Resources, and the Convention on the Regulation of Antarctic Mineral Resource Activities (the Antarctic Minerals Convention) would be the instruments for specific treatment and, as appropriate, authorization of the activities with which they deal;

b) a set of basic principles for the protection of the environment that would apply to all activities in Antarctica;

c) provision for elaboration of legally binding measures adopted pursuant to Article IX of the Antarctic Treaty and setting forth the obligations of

the Parties to ensure compliance with them;

d) provision for accelerated entry into force for annexed measures, where necessary, including in cases where urgent action is required;

e) establishment of a small and cost-effective secretariat to carry out specified functions for the Parties to the Antarctic Treaty, including:

i) provision of data and information services, for:

- identification of the need for, and assessment of the implementation and effectiveness of environmental protection measures; and
- the operational needs of activities in Antarctica;
- facilitating access to Antarctic scientific data; and

ii) provision of up-to-date, accurate and publicly available information about the Antarctic Treaty system;

f) agreement on a compulsory dispute settlement mechanism applicable to disputes over comprehensive measures;

g) establishment of an advisory body of the Treaty Parties to provide expert scientific and technical advice to the Antarctic Treaty Consultative Meetings in assessing the effectiveness of, and compliance

with, any measures agreed upon as well as other measures adopted pursuant to Article IX of the Antarctic Treaty.

2) initiation of the program of work called for in Recomendation XV-1 adopted at ATCM XV in Paris to review the existing body of measures for the protection of the Antarctic environment, in order, inter alia, to:

a) identify those measures which should be updated, strengthened or otherwise improved;

b) ensure that the legal obligation to implement and ensure compliance with such measures is clearly stated;

c) identify the need for additional measures;

d) provide for those measures to be legally binding;

e) insititutionalize this process as a coherent and regular feature of ATCMs, including the proposed establishment of an advisory body.

Let me close by emphasizing that the United States has and will continue to take the lead in working toward a comprehensive system for the protection of the Antarctic environment. A key element in that effort will be ensuring effective compliance with the body of environmental protection measures already elaborated within the Antarctic Treaty system as well as developing amd extending the innovative and anticipatory system of environmental protection it has created. We hope to work with the Congress to ensure that the United States retains the leadership in Antarctic Treaty affairs that it has in the conduct of scientific research in this continent.

Mr. TORRICELLI. Thank you, Mr. Bohlen.
Dr. Wilkniss.

STATEMENT OF DR. PETER WILKNISS, DIRECTOR, DIVISION OF POLAR PROGRAMS, NATIONAL SCIENCE FOUNDATION

Dr. WILKNISS. Thank you, Mr. Chairman. I will summarize, with your permission. I appreciate the opportunity to present the views of the National Science Foundation on Antarctic minerals policy and related issues, and the special convention on environmental comprehensive measures by the treaty.

We defer to the Departments of State and Justice as far as international policies and legal issues are concerned. Our testimony will be from the point of the view of the agency that is responsible for the United States Antarctic Program. By presidential directive, the Foundation is budgeting for and managing the entire United States Antarctic Program, including logistics, as one single package.

We would like to make our considerations in the context of overall current developments in the Antarctic. Foremost, there is scientific research in all disciplines. There is economic activity concerning marine living resources and tourism. And there is the issue of environmental protection, ever-increasing in all aspects of human activity that do take place.

The 1988 Convention on Regulation of Antarctic Minerals Activity, CRAMRA, is an important addition to the treaty. The issues arising if CRAMRA is ratified and if it is implemented have been examined thoroughly in the excellent report that Peter Johnson of OTA referred to earlier—the prospects of minerals treaty for Antarctica, and an NSF-sponsored dialogue at the Keystone Center in Colorado that brought a great variety of individuals together, including scientists, to provide us input.

Based on these thorough examinations, we have the following concerns. We believe that the freedom of scientific research on the continent and in the surrounding oceans must be maintained. We are concerned that over-regulation of research support activities might occur, and that must be avoided.

As far as implementation is concerned, we believe that a focused United States Antarctic Program, with a strong research component as the major expression of U.S. interest on that continent, has served well to maintain our influential presence on the "Ice" as it is called, as well as to keep options open in our participation in the Antarctic treaty system.

In keeping with the objectives of the Antarctic program, and a long-standing United States investment in the southern area, the Antarctic program provides a comprehensive base from which to expand into any interest that would occur as we go along in Antarctica for America, including the CRAMRA.

Of course, the present program does not address all the emergent aspects of the CRAMRA, but we are confident that appropriate involvement of other U.S. agencies in their areas of expertise, as well as the private sector, will give us the means to serve our nation's interests well.

In changing to the second topic, the special convention on comprehensive environmental measures of the treaty, we wholeheart-

edly support this convention.[1] I believe that the treaty has done very good work in the environmental area that has not been publicized and has not been recognized, because the treaty does not have a mechanism to do so.

I think that this convention will serve well to focus and enhance the treaty's intentions and recommendations for a comprehensive system, and we in the Foundation will do everything in our power to work with the State Department as the positions for the U.S. are developed, and to carry out a visible example on the continent itself.

Thank you very much, Mr. Chairman.

[The prepared statement of Dr. Wilkniss follows:]

[1] Witness indicates he intended to say: "In changing to the second topic, the special agreed measures on Antarctic conservation in the treaty, we wholeheartedly support these measures."

NATIONAL SCIENCE FOUNDATION

STATEMENT OF DR. PETER WILKNISS

DIRECTOR, DIVISION OF POLAR PROGRAMS

BEFORE THE

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

SUBCOMMITTEE ON TRANSPORTATION, AVIATION AND MATERIALS

AND

SUBCOMMITTEE ON SCIENCE, RESEARCH AND TECHNOLOGY

U.S. HOUSE OF REPRESENTATIVES

JULY 12, 1990

Thank you, Mr. Chairman, for the opportunity to present the National Science Foundation's views on Antarctic Minerals Policy and related issues. With regard to the foreign policy and legal, including constitutional concerns, we would like to defer to the Departments of State and Justice. Our discussion will be concerned with minerals regime issues in the overall context of developments in and around the Antarctic from the point of view of the agency (NSF) responsible for the U.S. Antarctic Program (USAP).

The President has directed that the USAP is to provide for an active and influential presence on the continent in support of the Antarctic Treaty. Presidential Memorandum 6646, dated February 5, 1982, directs the National Science Foundation to "budget for and manage the entire United States national program in Antarctica, including logistic support activities so that the program may be managed as a single package." We intend to continue our principal role under this directive, providing scientific and environmental leadership for the Antarctic program.

At present the major considerations for the conduct of the USAP are:

- Scientific research in all disciplines;
- Economic activities concerning,
  - Marine living resources,
  - Tourism

- Environmental protection, an area of greatly increasing importance in all of these types of human activity in, and around the Antarctic.

The status of these different areas of U.S. involvement in Antarctic affairs is changing rapidly, in part due to outside pressures resulting from the increased awareness and attention being focused on the continent and the surrounding oceans worldwide.

The modern era of scientific research in the Antarctic began with the International Geophysical Year (IGY) of 1957, which coincided with the launching of Sputnik and the beginning of earth observations from space. Ground-based and space observations, combined with aircraft flights and balloon-borne instrumentation, now provide the means for research at the bottom of the earth in a three-dimensional mode. The austral cryosphere has been identified as major participant in global environmental processes, passively, as well as actively. Examples are some evidence of increases in greenhouse gas concentrations indicated by ice cores, such as the one from Vostok station; the increased exposure to ultra-violet radiation as a result of the so-called Antarctic Ozone Hole, and the confirmation of the phenomenon of seasonal Antarctic Ozone depletion as a result of man-made chemicals.

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There is no doubt that results from Antarctic research are vital to understanding planet Earth, and has impacted the decision-making on actions that could influence the environment.

The exploitation of Antarctic marine living resources was the first economic activity in the Southern oceans. Dating back to the middle of the last century, it concentrated on whales and seals. In recognition of the serious consequences, to a number of marine species protective measures are now in force, including Antarctic Treaty measures such as "CCAMLR" the Convention for the Conservation of Antarctic Marine Living Resources. Consideration is now being given to support sufficiently CCAMLR to achieve effective implementation and control, in particular, for harvesting of finfish, and essentially unknown krill and squid resources.

Tourism, including private expeditions, is now the fastest growing economic activity in Antarctica. Tourist populations already approach the total number of program personnel from all Antarctic Treaty nations. Further growth is certain, based on the introduction of larger ships, and more activities on the continent, especially in coastal areas, but including the South Pole itself. Tourism has impacted the Antarctic through ship accidents, such as the Bahia Paraiso, and in a more general way through ever more visits at established research stations. The impact of repeated visits on animal habitats or the pristine areas of prime interest

for scientific research are of increasing concern. The introduction of stricter controls and general regulation of tourism is being discussed. Tourism by Antartica Treaty member nations poses some difficult jurisdictional problems, because Treaty nations hold different views and treaty governance follows citizenship, not territory. Enforcement is exacerbated by the huge geographical extent of the continent of about 5.4 million square miles. Thus, enforcement regulations must be addressed internationally, not by the U.S. alone.

The 1988 Convention on the Regulation of Antarctic Mineral Resource Activities (CRAMRA) is an important addition to the Antarctic Treaty. If CRAMRA is ratified and implemented, potential U.S. Antarctic mineral activities could be regulated to a greater extent than is true for other economic activities, such as the harvesting of marine living resources and tourism. This would be appropriate given the likelihood that mineral activities could result in greater environmental damage than any other human activity in Antarctica.

This is borne out by a thorough examination of all aspects of CRAMRA by the Office of Technology Assessment (OTA) of the U.S. Congress in a report entitled "Polar Prospects, A Minerals Treaty for Antarctica." This report points up the very complex issues facing the Antarctic Treaty system as well as the implementing

process in the U.S. In anticipation of the formal process of devising the U.S. strategy, framework, and organizational structure for the implementation of CRAMRA in the executive branch, NSF supported a policy dialogue at the Keystone Center in Colorado. This dialogue was initiated to be certain that issues arising from CRAMRA implementation were carefully considered by interested and informed individuals, including scientists. This series of discussions provided a forum for a wide and diverse group to exchange views and to focus on difficult issues in detail. The Keystone dialogue allowed free-wheeling interaction and contributed to understanding among previously contentious groups.

We would like to focus on the major concerns and implementation aspects arising from the OTA report and Keystone Center dialogue. Our discussion will be from the point of view of NSF as the manager of the current U.S. Antarctic Program.

Two particular considerations are most important:

The freedom of basic scientific research in the Antarctic must be maintained. In particular, there is a fine line between basic research in the geophysical sciences to understand the plate tectonic workings of the earth and prospecting for commercial purposes. A clear delineation of basic research

in an international setting with guaranteed availability of the results and data should amply satisfy even the most suspicious critics.

The overregulation of research activities in the Antarctic must be avoided. The Treaty System is making great strides, i.e., a new Code of Conduct for Waste Disposal and, in particular, the U.S. Antarctic Program has underway a major new initiative to improve all environmental aspects of the American presence on the continent and the surrounding oceans.

In general, we conclude that a focused USAP with a strong research component as the major expression of U.S. interest in the Antarctic will serve best to maintain an influential U.S. participation in the Treaty. In addition, it will help provide the essential intellectual and operational resources, as well as practical experience, to devise the most effective CRAMRA implementation mechanism for the U.S.

In particular, past, present and anticipated investment in the USAP will contribute to CRAMRA implementation in several ways.

- Creating basic knowledge about the physical environment and changes thereto;
- Educating scientists, administrators and technical experts in all areas of Antarctic endeavors;

- Developing, introducing and testing new programs and procedures for environmental protection on an interagency basis;
- Facilitating bipolar, i.e., Arctic and Antarctic cross fertilization in scientific research, environmental programs and technology development and use;
- Establishing enhanced international collaboration under the Treaty by the managers of National Antarctic Programs (COMNAP) and the Standing Committee on Logistics and Operations (SCALOP);
- Conducting joint international workshops and implementing treaty recommendations in waste disposal, aviation safety and the conduct of environmental assessments;
- Establishing regional cooperation, i.e., the Ross Sea in Gateway Centers and centers in the Antarctic;
- Acquiring new facilities, i.e., a research vessel with ice breaking capability (RVIB), McMurdo Research Laboratory, and advanced technology stations in the Antarctic interior (South Pole);
- Establishing new methods and facilities for communication;
- Establishing new data bases, especially for environmental protection;
- Providing a U.S. intra-structure of stations and transportation inter- and intra-continental.

The USAP has developed and continues to maintain the essential core activities necessary to expand any area of U.S. activities that may serve U.S. interests in the Antarctic, including CRAMRA. While the present program does not cover all emerging aspects of CRAMRA, we are convinced that with appropriate participation by other federal agencies, in their area of expertise, the present approach would serve national needs.

Finally, we would like to consider the Special Antarctic Treaty consultative meetings in Santiago, Chile in November of 1990. The special meeting's objective is "to explore and discuss all proposals relating to the comprehensive protection of the antarctic environment and its dependent and associated systems." We wholeheartedly support this Treaty initiative. In the past the Treaty Parties have paid considerable attention to the protection of the Antarctic environment. However, because of the special nature of the Treaty output, the general public is not generally aware of the Treaty achievements and may perceive a lack of attention to the environment. This is enhanced by an absence of enforcement and the conduct of the different national programs which varies widely. The U.S. program itself is under intense scrutiny and major strides are being made to remedy past problems and to retain an exemplary position on the continent. We will work, both as part of the U.S. preparations led by the Department of State, as well as in practical terms to address the

environmental issues in the Antarctic. We view the special convention as a great opportunity to further solidify and implement environmentally sound practices for all Antarctic programs.

Thank you Mr. Chairman for the opportunity to testify. I will be pleased to respond to any questions.

Mr. TORRICELLI. Thank you very much for your testimony, Dr. Wilkniss.

Mr. Bohlen, what are the Administration's intentions for submitting the treaty, and what timing do you envision?

Mr. BOHLEN. I see as one of my functions in my new role advising the Secretary of State on when and whether to submit the treaty to the Congress.

Mr. TORRICELLI. Are you prepared to share that advice?

Mr. BOHLEN. And I think—I'll be honest. I would not recommend to him that he send it forward when there are clearly objections to it. I think we need to——

Mr. TORRICELLI. Are you discussing objections within the Administration or objections within the country to the Convention?

Mr. BOHLEN. Yes. I think it would be premature to send it up before we have the meeting in Chile and see how this is all going to evolve—to see whether the parties can reach any kind of a consensus.

Mr. TORRICELLI. So whether or not the United States should proceed, with you, is still very much an open question?

Mr. BOHLEN. We strongly support the Convention. But I think we have to resolve some of the objections that have been raised before we submit it.

Mr. TORRICELLI. What is your view on the French and Australian proposal for a more comprehensive environmental regime? Is there a position you are urging the United States to have in this?

Mr. BOHLEN. One of the problems with the proposal as submitted is that it did not go into much detail, so it is hard to really analyze it. I was not at the meeting last fall in Paris when the proposal was put forth, but I understand that many of the parties interpreted the proposal to mean that this new convention would be outside the Antarctic treaty system. I think that aroused a lot of concern and opposition. I believe the French-Australian position has been clarified since then to indicate what they really meant is that it would be within the treaty system.

That certainly removes a significant objection.

Mr. TORRICELLI. And what would you recommend for a U.S. government position with regard to the proposal?

Mr. BOHLEN. I think we need to see more details. It calls for a natural reserve, a land of science. Clearly that is consistent with our objectives. But I believe, even though it was not stated, the presumption was that it was an alternative to CRAMRA, and that it was going to ultimately support a total ban on mining.

I think really, until we see the details, it is very hard for us to conclude what our positions would be.

Mr. TORRICELLI. And if indeed that were the case, that it is a substitute, and that it is leading to a total ban, where does that lead you in reaching a judgment of support or opposition?

Mr. BOHLEN. I think that's what the Administration is going to have to wrestle with over the next three months, as we look at all the options here, preparing for the Santiago meeting.

Mr. TORRICELLI. So a fair conclusion of your testimony would be that if that indeed is the French and Australian position, if those are their intents and desires, you are reserving judgment?

Mr. BOHLEN. I am reserving judgment. We have not fully reviewed internally all the possible options.

Mr. TORRICELLI. Mr. Wilkniss, I have never been to Antarctica. I have read considerable press accounts and seen accounts that are critical of the residue of scientific work—solid waste, the debris that is being left at American sites. Could you react to those reports, and if they are accurate, what is it that needs to be done to correct them?

Dr. WILKNISS. Yes, Mr. Chairman. Indeed, there are sins of the past in our program. The United States has been in the Antarctic year-round for 30 years, since the International Geophysical Year in 1956.[2] And in those days, environment was not on the forefront of issues in the public awareness. We clawed out a beachhead for our program in the Antarctic rather than worrying about being commensurate with the pristine environment.

This has been fully well recognized. We have done a total survey of our role in the Antarctic—the legal and regulatory statutes that apply, what our duties are—and we have devised an environmental protection agenda and, furthermore, an implementation plan.

This has culminated in an initiative by the President in our budget for safety, environment and health programs that stretches over five years and has a $30 million component that is concerned with the Antarctic environment. The purpose is three-fold. One, clear up past problems; two, bringing present operations in consonance with evolving laws and regulations; and three, develop better technology for the future.

Mr. TORRICELLI. Mr. Wilkniss, then stated simply, the fields of debris and oil drums that many of us have seen in news reports, is there a determination to have those items entirely removed? Is there a deadline to do so?

Then, in the future, is there an operating plan of that which goes to Antarctica to return from Antarctica?

Dr. WILKNISS. There is no absolute deadline, Mr. Chairman, as to when this should be accomplished. It is a very costly task of great magnitude. We have our own implementation plan, and we believe what is necessary is a cradle-to-grave waste management plan to minimize any material taken to the Antarctic, or whatever we take should be taken out.

In our smaller stations that will certainly be possible and is already being done now. In our biggest stations that will take several years to determine.

Mr. TORRICELLI. Mr. Wilkniss, speaking only for myself, as part of one of the subcommittees of the committee that authorizes funding for NSF, you should know, when we return to this issue whether or not there is a specific plan and whether or not there are deadlines, that will have a great deal to do with how I personally, and I venture to say many of my colleagues, look at continued authorization for funding.

It has been known, if the press reports are to be believed, these situations are egregious, and they need to be corrected. I am glad

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[2] International Geophysical Year was 1957/58.

you are giving it some attention. Please understand the strength with which some of us will return to this issue in the future.

Mr. Valentine?

Mr. VALENTINE. Thank you, Mr. Chairman. I would like to encourage the Chairman to take this trip. I would like to say to Mr. Wilkniss that if there are opportunities for Members to go again, that I am available. I want to be sure this time, also, that it is a round-trip ticket.

I want also to publicly express to you—I believe for the first time—that I appreciated the many courtesies extended to us while we were there two and a half years ago. I want to say to my colleague and co-chairman that, while there is a need to proceed, not only to him, but also to you, there is a need that is reflected by the attitude of many, if not most, of the Members of Congress, that we do need to proceed to correct the situation that the Chairman referred to.

I would say also, for those who go and view what is there at McMurdo, that it has a certain inherent starkness that is difficult to change. When you take a bulldozer and scrape away a place to put a building in that part of the world, no vegetation comes to cover the wound. It is there forever, until the ice hits. That was the thing that struck me about it.

I would like to ask one of you, or both of you, if you could, for the benefit of the subcommittee, briefly describe to us the international presence on that continent. Who is there? What nations are there, where are their bases, and what are they there for?

Dr. WILKNISS. I will take that question, Mr. Valentine. At present, we have about—almost 30 nations that do business on the continent—that have research programs, either year-round, or summer stations, or that have ocean expeditions going to the Antarctic. I think more than two-thirds of the world's population are reflected. And, of course, the major players are the United States, the U.S.S.R., India, the P.R.C., all the South American countries——

Mr. VALENTINE. P.R.C.?

Dr. WILKNISS. The People's Republic of China.

Mr. VALENTINE. Oh, I see.

Dr. WILKNISS. Korea, South Korea, East and West Germany, France, England, Australia—all the important countries that are involved in scientific research or interested in global affairs, or with the economic issues, do maintain an active program on that continent. There are a number of other countries, and the total is almost up to 40, that are kind of associated members, that want to be in on it, but have not seen fit to set up the admissions ticket—a research program in the Antarctic.

Mr. VALENTINE. The United States is the only nation with a permanent residence at the Pole itself, is it not?

Dr. WILKNISS. That is correct, Mr. Valentine, and the only interior station that comes close is the Vostok Base of the U.S.S.R. that is at the geomagnetic South Pole, about three hours flying from the South Pole itself.

Mr. VALENTINE. And the New Zealanders have a permanent functioning base close to McMurdo, the United States base at McMurdo, then the permanent American base at the northern

part. Briefly, what other permanent facilities are there that are comparable to the presence of the United States, the Soviet Union, Australia and New Zealand?

Dr. WILKNISS. I would think you are looking at tiers. The United States and the U.S.S.R. have the biggest program. The U.S.S.R. has 10 bases. We have three. The only thing that comes close to McMurdo, our biggest base, would be one of the Soviet bases. We have a second tier of countries in investment and presence. That would be the United Kingdom, France, Australia, West Germany.

The Australians have five bases; the United Kingdom has three or five; and France has two bases. They are building one in the interior, while West Germany is concentrating all of their investment in the oceans around the Antarctic, with the world's best research icebreaker.

Mr. VALENTINE. With the world's best research icebreaker. Okay.

Dr. WILKNISS. Yes, sir.

Mr. VALENTINE. Do we know what these other countries—I am asking both of you these questions—do we know what these other countries are up to in those bases of those operations? Can you go to visit the Soviets? I know you can visit the New Zealanders. Tell us a little something about that.

Dr. WILKNISS. One of the exemplary provisions of the Antarctic treaty is that of open inspection. That has served as an example in other areas of the world and in space. So it is a right of the United States to carry out inspection of all the other stations, and we exercise that right under the leadership of the State Department. Every three years a U.S. team of experts gets together to make official inspections of selected stations, including the Soviet Union's stations. They are shown around openly.

But much more important, the Antarctic is probably one of the most international research laboratories that you can think of. At McMurdo or the Soviet stations, it is not unusual to have an exchange for citizens from the U.S. and U.S.S.R. or other countries. And if you go to places that are easily accessible, like King George Island in the peninsula, 12 nations have their scientists and support personnel there that mingle on a daily basis. The same is true for the research ships.

The Antarctic, not only in keeping with the letter, but the spirit of the treaties, is totally transparent. There is a total exchange of technical and support personnel, and everything that goes on is well known to all the other nations.

Mr. VALENTINE. Is there anything that you have noticed that is going on under the sponsorship of other nations, or by representatives of other nations that you think would be of special interest to those of us who want to see the continent of Antarctica preserved?

Dr. WILKNISS. I think the foremost concern we have, and that the Chairman alluded to, is the environmental impact of the research stations. That has not been on the forefront in the past, because of the difficulty and the cost. I think everywhere now, through the treaty system, through new measures of codes of conduct of waste disposal, as well as actual cleanup efforts in the Antarctic, you can see that all of the member nations that are down there and have stations are trying to clean up and trying to do better.

Mr. VALENTINE. Where people go, they consume, as we know, and they leave trash. What about the efforts to seriously introduce tourism into the continent, and what are some of the problems which are attendant to that?

Dr. WILKNISS. Tourism is the fastest growing activity in and around the continent. I think there are very responsible tour operators, and they have done a very good job.

Mr. VALENTINE. Is it true to say that those who become tourists in this part of the world, there has to be a certain amount of conspicuous consumption there? That's a high-ticket deal; isn't it?

Dr. WILKNISS. It is——

Mr. VALENTINE. Only the very wealthy will be able to take a trip to Antarctica. Is that a fair statement?

Dr. WILKNISS. That's a very fair statement, Mr. Valentine, but that may be changing shortly. If you want to visit the interior as a tourist, say the South Pole——

Mr. VALENTINE. That doesn't apply to members of Congress, though.

Dr. WILKNISS. If you want to visit the South Pole and the interior, or ski through Antarctica, you have to shell out on the order of $35,000 to $70,000. These are very special expeditions, with specially equipped ski equipment and field camps. I should say the environmental impact has been very minimal, and the tour organizers have done a good job of keeping things clean.

The most numerous tourists occur on the tourist ships. The ticket is something like $7,000 to $10,000, depending on where you left from. The ships hold about 100 tourists, and they visit around the coastline, different research stations. But now, I believe, ships are under construction that can be brought to the Antarctic that will hold 400 people, and the ticket price is going down. The potential risk for accidents, of impact is growing.

Mr. VALENTINE. This question again to each of you, and I am just about through, Mr. Chairman. I don't want to trespass on your time and patience.

Isn't there a real need to be able to control the business of tourism there, and regulate it? Is any effort being made in that direction? Because one can imagine the possible strain on the constabulary, the armed forces. I think the Navy maintains that base at McMurdo. They have airplanes, and the first time somebody is overdue, some tourist, the search and rescue missions, the problems inherent in all of that—can you talk to us, either one of you or both of you, about that problem?

Dr. WILKNISS. I believe the time has come to deal with the tourism. And I think it has to be done on two levels. Right now the Antarctic treaty and our own laws provide the statutes and ability to deal with the actions of United States citizens in the Antarctic. Under the Antarctic Conservation Act that the Foundation is empowered to carry out, we have passed regulations that concern the behavior and also the penalties that U.S. citizens will incur if they do not abide by the Antarctic Conservation Act, which is the U.S. implementation for the Antarctic treaty recommendations.

As far as tourist companies, especially those that operate from other countries, it is very difficult to take unilateral action, and I think that has to be done in an international framework, as the

Secretary pointed out. We cannot do this alone. The coastline of the Antarctic is 20,000 miles, 5.4 million square miles. There is no way that I can see that we could police this. So we need international cooperation from the countries where tours are organized, from those countries where the gateways exist, where the ships are refurbished and the tourists are taken in and out and the airplanes leave.

To me, an international scheme to deal with the tourism is important. The issue is, are the tours run responsibly? Do they have a captain who knows how to maneuver in ice? Do they have airplanes that have proper certification to fly in the interior? Do they have weather information? Do they have insurance? Are there liability agreements?

If we see a problem, we come under litigation, even if we try to help the tourists, because of all sorts of intricate statutes. We believe all of this has to be cleared up. We can do it, and have already implemented regulations for cur own citizens that include U.S. citizens on tours organized by companies in other countries.

But the whole question of tourism on the continent has to be dealt with in the international framework, and I think it has to be part of the special convention that we are preparing for.

Mr. VALENTINE. Thank you very much. I have one more statement. Did I understand that on this business of tourism that there was some years ago a group who organized airplane excursions from New Zealand, and the first plane went down, crashed, lost all aboard?

Dr. WILKNISS. That's correct, Mr. Valentine. That was a flight from New Zealand to the vicinity of McMurdo. The airplane, a DC-10, flew into a mountain, and 270 people perished. And the United States Government has been sued in District Court in the District of Columbia in a class action suit by the survivors of the Air New Zealand crew for contributing in negligent ways to that accident.

Mr. TORRICELLI. Ms. Schneider?

Ms. SCHNEIDER. Thank you, Mr. Chairman.

Mr. Bohlen, I wonder if you can tell me, has the State Department been contacted by any U.S. companies who are interested in pursuing any mineral activities, including possible oil and gas operations?

Mr. BOHLEN. I know of no such interests.

Ms. SCHNEIDER. If they were to approach the State Department, would the United States allow one of our own corporations or a citizen to undertake some sort of commercial prospecting there for development?

Mr. BOHLEN. No. We have an agreed moratorium [3] in effect until such time as the Minerals Convention is ratified. So at this point, there would be no possibility of us approving that kind of activity. [4]

Ms. SCHNEIDER. Okay.

Mr. Wilkniss, I was wondering if you could tell me if any prospecting on the part of other countries is taking place, to your knowledge, that might be involved with NSF's mission there?

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[3] Witness asks that "non-binding" be inserted before "moratorium".

[4] Witness adds the clarification that the State Department has no domestic legal authority to prevent such activity.

Dr. WILKNISS. In my point of view, there is a very fine line between basic research in geophysics and geology and prospecting. There are remote sensing techniques that depend on the sophistication of a research unit and its equipment that will go to the Antarctic. In my opinion, some other countries—Japan, the Soviet Union—have done, even West Germany, have done much more advanced geophysics. They are much better equipped than the United States.

While we have been kind of bending over backwards to not even give the appearance of prospecting, some other countries have used some very sophisticated equipment. I think that has not been in the best interests of our research scientists. We are now trying to develop international programs where we will be on an even footing.

As far as the data release, that has been a problem. Supposedly, all Antarctic research data are openly exchanged. I should say that if we did not have something to trade for, some of our research, we certainly did not get the data from other countries, or it was like pulling teeth. From some of them, I believe we still have not gotten them.

Ms. SCHNEIDER. So can this lead to a continuation of undermining any of our scientific cooperation, then, that is now being fostered under the Antarctic treaty?

Dr. WILKNISS. That is a difficult question. I hope we can avoid this by what I claim is the openness of the Antarctic Treaty, and other nations agreeing that our scientists can go on these sophisticated ships that they are sending down there. That is what we are trying to do.

Whether we know of all the research missions that are being carried out in the huge environs of the southern oceans, I am not sure.

Ms. SCHNEIDER. Please forgive me. When you were mentioning the countries that were primarily involved with the more sophisticated equipment, you mentioned Japan and who else?

Dr. WILKNISS. The Soviet Union.

Ms. SCHNEIDER. And that's it, those two?

Dr. WILKNISS. West Germany.

Ms. SCHNEIDER. Okay.

Dr. WILKNISS. These are the ones that come to mind. Of course, there are other countries that have just as much forefront capabilities for commercial prospecting as is the case for some of our companies.

Ms. SCHNEIDER. Both your testimonies have been quite enlightening, and I thank you for your insights. Certainly as a member of this committee and also the other committee of jurisdiction, Merchant Marine and Fisheries, I look forward to continuing to work with you, and I am hopeful that the United States will do the right thing.

Thank you.

Mr. TORRICELLI. Mr. Campbell.

Mr. CAMPBELL. Thank you, Mr. Chairman.

I apologize. I had to be out of the hearing room for part of your testimony. Out of respect for the fact that I might be covering

ground, I will be very brief. I have one line of inquiry, and it is to the Secretary.

As you might have heard from my questions to the earlier panel, I am interested in the issue of colonization, and what agreement potential there might be on rules for colonization, and of course, the attributes of that, such as the disposal of waste that might result. Could you kindly inform me what discussions there are, and what instruments we might see for international agreement on the question of colonization?

Mr. BOHLEN. I am unaware of any desire to create colonies on the continent. My understanding is that any such activities would require an environmental impact statement, if not a formal EIS, at least a serious look at what the impact of such activities would be.

Mr. CAMPBELL. Might I ask, Mr. Secretary, under what Treaty or other obligation would there be the requirement for the environmental impact statement?

Mr. BOHLEN. Under the Antarctic Treaty itself.

Mr. CAMPBELL. The 1959 Antarctic Treaty?

Mr. BOHLEN. Yes.

Mr. CAMPBELL. And that study having been done, would it require the approval of any signatories?

Mr. BOHLEN. I guess in the final analysis, a country can do what it wants. But it has to go through the impact review statement, and get it through the other parties.

Mr. CAMPBELL. That was my worry, that really there is no system to prevent——

One last thing if I might. It is my understanding——

Mr. BOHLEN. Excuse me, if I might interrupt.

Mr. CAMPBELL. Oh, please.

Mr. BOHLEN. One of the reasons that we saw for the Chilean proposal to meet in November and discuss a comprehensive system for protecting the environment was, I think, that the issue you raise needs to be addressed.

Mr. CAMPBELL. Indeed, that was the force of my initial question, what instruments do you see in the offing that might control that, and if you think that will be part of the environmental discussions, I would urge it to be so.

The last point I had is—and my information may be inaccurate, but I was given to understand that there has been an effort to create colonies by Chile on the Antarctic peninsula. They may be experimental or temporary, but that's my information. If you know to the contrary, I would be happy to be corrected.

Mr. BOHLEN. Our team is unaware of anything that you could call colonization. There may have been individual small buildings put up. We will look into it.

Mr. CAMPBELL. Thanks so much. That was my inquiry.

Mr. TORRICELLI. Ms. Schneider?

Ms. SCHNEIDER. I would ask unanimous consent that my statement be included in the record, please.

Mr. TORRICELLI. Absolutely.

Ms. SCHNEIDER. And might I also ask if there was an intentional effort to set the environment for this hearing this morning so that the temperature would reflect that of the Antarctic?

Mr. TORRICELLI. If it helps you to have a greater feeling, a greater understanding——

Ms. SCHNEIDER. What it has done is moved me to sympathize with the taxpayer, and recognize that we are wasting all of his money to overindulge in coldness for setting an appropriate environment.

It would be great if the Science and Technology Committee would take some leadership on improving our technology skills in moderating the climate in our own hearings rooms.

Mr. TORRICELLI. I have, in these first few months of being Chairman, discovered the vast powers in my command. Lowering the temperature in this room is not among them.

Ms. SCHNEIDER. This is the only reason that I raised it with you, because I know that you can do it. Thank you, Mr. Chairman.

Mr. TORRICELLI. Mr. Bohlen, just for a moment to pursue Mr. Campbell's question. Staff has told me that in fact the Chileans in the past have actually had people—women—go to Antarctic to give birth to enhance territorial claims. That is close to colonization as I can imagine going without a declaration.

Mr. CAMPBELL. That's exactly what I had heard.

Mr. BOHLEN. I will have to inquire whether giving birth requires an EIS.

Mr. TORRICELLI. It only leads in one direction.

Mr. CAMPBELL. Mr. Chairman, if I might—I am pleased that you brought that up. I thought perhaps my recollection was wrong. That is precisely what I had heard, and for the purpose of establishing Antarctic citizens. Then you have a premise in international law to your claim.

One of the deep dark secrets of my past is that I used to teach international law. This instance was somewhere deeply buried there. That was one of the reasons for doing it.

So I think there is more to this than might meet the eye, that there is an interest in establishing a permanent colony.

Mr. BOHLEN. Your comments underline the importance of the Antarctic treaty system, whereby claims are set aside by all claiming countries, and it is clearly in our interest to perpetuate the present system and avoid that kind of colonization.

Dr. WILKNISS. May I comment on that, Mr. Chairman? I think one has to look at the question of colonization from the point of view of the claiming nation. Let's take Chile. I would not say they have a colony, but they have a settlement. Yes, indeed, it is a small town. They have a school, a hospital, a post office; they have families that are assigned for two years there. Children are born there; children live there; and children, by the way, feel very much like Antarctic citizens.

The Antarctic is administered from the province of Tierra del Fuego. So Chile looks at the peninsula, its claim, as part of Chile. It is included in the administration. It is called the Province of Terra del Fuego and Antarctica, and indeed, they have a full-fledged little town. So do the Australians.[5]

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[5] Witness indicated he intended to say "Argentinians."

Mr. TORRICELLI. Thank you, Mr. Wilkniss.

Mrs. Morella?

Mrs. MORELLA. Thank you. Mr. Bohlen, I appreciate your openness and your willingness to talk about negotiating and working out the number of problems that there may be. I really want to direct a question to Mr. Wilkniss. Right now, NSF is the lead agency in Antarctica, right?

Dr. WILKNISS. Yes.

Mrs. MORELLA. How will your responsibilities shift with the Convention and with CRAMRA, if it is ratified? I assume there would be some shift of responsibilities. How do you see that shift?

Dr. WILKNISS. Mrs. Morella, the OTA report lays out a number of options as to how the implementation in the Executive Branch could be done. There is no question that it would need new institutional arrangements.

I think it depends on the question to which degree the United States will carry out or participate in a CRAMRA. If we only go to the first step of ratifying and not sponsoring, ourselves, either prospecting or exploration and development, I think the impact would be minimal. You would have to add some expert specialists in the respective agencies, and that would not be a major undertaking.

In the case of prospecting, which was already raised as an issue, that is to use the most sophisticated means at hand by private industry to understand other oil and gas deposits or intrusive prospecting to ascertain is there gold or diamonds, or what have you—I've never seen any—then I think it would take additional resources. I believe in the prospecting case, NSF with assistance from others, could handle this relatively small scale addition to the U.S. interests in the Antarctic.

If, however, we would go to full-fledged sponsorship of exploration and development, that would be an undertaking on a scale that I have not even seen in the Arctic. That would require national resources that we have not put together yet, not even in our energy provinces in the Arctic. Then, of course, it's a new question and NSF would not be the agency that could handle it alone or with others.

Mrs. MORELLA. And if there were implementation, would it be an obstacle to some of the scientific research that NSF has been undertaking?

Dr. WILKNISS. That is one thing to worry about. If you look at how such exploration might occur, if we are unlucky, the world's greatest find of whatever might happen to be right in the back yard of what we think is the best place to do the best science. I think that would be quite a conflict, and I am not sure who would win out.

Mrs. MORELLA. How closely do you work with our Department of State? How closely, as an example, do you work with Mr. Bohlen's part of it?

Dr. WILKNISS. I should say almost on a daily basis. We are part of the Antarctic Policy Working Group. Mr. Bohlen, the Secretary, is the Chairman of the Antarctic policy group, and the working group is chaired by Mr. Arnaudo, who is here. And we are a member of that group. Either there are scheduled meetings or, in

the event of unforeseen news or what have you, there are special meetings being called. So I would say there is almost daily contact.

Mrs. MORELLA. Fine. Thank you very much.

Mr. TORRICELLI. Mr. Wilkniss, Mr. Bohlen, thank you——

Mr. BOHLEN. Mr. Chairman, if I could make a point of clarification? In looking at some of the testimony to follow, I notice that the point is made that it is U.S. policy to keep open the option of mining in Antarctica. I have been back through the NSC directives that led to that conclusion, and I interpret them differently. I interpret it that U.S. policy has been to—if there is ever to be mining in Antarctica, it would be U.S. policy to ensure that U.S. operators have an opportunity to participate in that activity on a fair and non-discriminatory basis. I just wanted to make that point for the record.

Mr. TORRICELLI. Thank you, Mr. Bohlen. Congratulations again on your confirmation.

Mr. BOHLEN. I look forward to working with you.

Dr. WILKNISS. Thank you, Mr. Chairman.

Mr. TORRICELLI. The committee, for its third and final panel, would invite Beth Marks, of the Sierra Club, James Barnes, of the Antarctic Project, Ian Dalziel, University of Texas, and Charles Bentley, University of Wisconsin.

Thank you all very much for your patience today and for your willingness to come forward and testify. We appreciate your time and attention.

As we indicated earlier, your entire remarks will be entered in the record of the hearing. We would appreciate your making a summary of your remarks, sharing whatever you think would be helpful to the committee. Please do attempt to be brief, so that we have as much time as possible to explore your thoughts and engage in questioning and inquiry.

Let's begin with Beth Marks.

STATEMENT OF BETH C. MARKS, CHAIR, ANTARCTICA TASK FORCE, SIERRA CLUB INTERNATIONAL COMMITTEE

Ms. MARKS. Thank you for the opportunity to testify, Mr. Chairman. I am Beth Marks, research biologist, and Chair of the Sierra Club's Antarctica Task Force.

The Sierra Club is the oldest conservation organization in the country, with over half a million members. Our primary goal has always been the preservation of the Earth's wild places. Antarctica is indeed the Earth's last and largest wilderness, and we are committed to the protection of its fragile environment and dependent and associated ecosystems.

We are totally opposed to the development of Antarctica's mineral resources. We believe Antarctica should be declared an internationally protected area, dedicated to science and other peaceful uses, where no mining can occur. The Convention on Regulation of Antarctic Mineral Resource Activities is not what is needed. It is not a protection agreement. It will facilitate mining by providing a legal framework in which mining rights can be obtained.

By permitting the industrialization of Antarctica, the open peaceful cooperation that had survived for thirty years will come to

an end. Mineral development activities could exacerbate tensions between claimants and non-claimants. It could pose a threat of militarization of the region, undermining a basic tenet of the Antarctic treaty, which is to prevent Antarctica from becoming the scene of international discord.

We submit that as a political matter, CRAMRA is effectively dead. Australia and France did not sign CRAMRA. There was every indication that they will refuse to ratify it. Without these requisite ratifications of all the claimant states, CRAMRA cannot come into force. In light of this stalemate, and in conjunction with the Sierra Club's belief that CRAMRA is not what is needed, we do not feel that a discussion of implementing legislation is productive. Congress should be focusing its energies on assuring that the United States takes a leadership role in negotiating a protection regime for the continent at the special consultative meeting in Chile later this year. It should also be focusing on the legislation currently in the Congress, which contains many important provisions which would protect the Antarctic environment. The Sierra Club is supportive of these bills. We hope that they can be moved swiftly to ensure that protective measures become a reality during this Congressional session.

The signers of the Antarctic treaty in 1961 understood the value of setting aside this remote continent for peaceful cooperation for the furtherance of science. Antarctica is indeed a global scientific laboratory of immense value. This should be its only use. The near pristine nature of the region provides a base line against which pollution in more populated regions can be measured. The research that depends on unimpacted environment would be compromised by the resultant dust and pollution from mining operations.

Antarctica's key role in influencing the global atmospheric and oceanic systems will also be affected by mineral exploitation. Melting of its massive ice cap from fossil-fuel precipitated global warming, or a decrease in its reflective properties from an oil spill or from dirt or dust, coating the ice cap, would affect the intensity of the temperature gradient between the Poles and the equator. This would affect the global climate.

Antarctica is the world's largest wildlife sanctuary, home to over 100 million birds, including seven species of penguins and six species of seals. It is the summer feeding grounds for the great whales. Mineral development activities will negatively impact this spectacular sanctuary, and Antarctica's entire ecosystem.

The animals that have evolved are so specialized in their adaptations to the subfreezing waters, that they are unable to mount a defense against any stress in their environment. Habitat degradation, pollution, oil spills—all can destroy in minutes what has evolved over millennia.

There will never be an environmentally benign way to mine Antarctica. Regulations, conventions and good intentions are meaningless when operators are confronted with 200 mile per hour winds or icebergs miles long. Even the most stringent environmental regulations in the world cannot guard against human error. We have seen this with the Amoco Cadiz, with the Exxon Valdez, with the Bahia Paraiso.

Thirty years of an escalating human presence have highlighted serious gaps in the Antarctic treaty system. We submit that the best way to fill these gaps, and to fully protect this fragile region is through the negotiation of an agreed set of comprehensive measures which would establish Antarctica as a wilderness and scientific reserve, where mineral resource activities are permanently banned.

By opting not to sign CRAMRA, Australia and France have provided us with the opportunity to permanently protect Antarctica's environment. The Sierra Club urges the United States to support this initiative, and to provide a leadership role in negotiating a protection regime for the region. The United States is a leader in enacting and enforcing environmental legislation. Sending a clear signal that we support a ban on mineral development and are willing to negotiate a strong protection regime would encourage many of the treaty nations to work with us.

We must draw the line at Antarctica. Degradation of its unique environment could have devastating consequences on global climate and sea levels, ocean and wind currents.

We also need to decrease our dependence on the consumption of fossil fuels. Global warming is taxing the life support systems of our planet. Instead of exploiting the very last sources of these fuels, we need to seriously start developing alternatives now. We can start now or we can start in a few days, a few weeks, a few months after we have managed to exploit the very last wilderness on Earth.

The value of Antarctica to the world is immeasurably greater than exploiting its resources. It is a zone of peace, providing experience in international cooperation. It is the world's only truly demilitarized zone. It is the best place on Earth to monitor and learn about global weather systems, global warming, and ozone depletion.

The protection of Antarctica is also vital to our soul and spirit. We have just begun to appreciate Antarctica's complex environment and its major contribution to the Earth's life support systems. Mineral resource activities will indeed jeopardize the value of Antarctica to science, peace, education and inspiration.

Thank you.

[The prepared statement of Ms. Marks follows:]

SIERRA CLUB

408 C Street, N.E. Washington, D.C. 20002 202·547·1141

July 12, 1990

STATEMENT OF BETH CLAUDÍA MARKS

Chair, Antarctica Task Force
Sierra Club International Committee

to the

SUBCOMMITTEE on SCIENCE, RESEARCH, AND TECHNOLOGY

and the

SUBCOMMITTEE on TRANSPORTATION, AVIATION, AND MATERIALS

of the

HOUSE COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

on

ANTARCTIC MINERALS POLICY AND RELATED ISSUES

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Appendix 1: Sierra Club Policy on Antarctica

"When we try to pick out anything by itself, we find it hitched to everything else in the universe." — John Muir

National Headquarters · 730 Polk Street · San Francisco, California 94109 · 415·776-2211

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ANTARCTIC MINERALS POLICY AND RELATED ISSUES

Good afternoon Mr. Chairman. Thank you for the opportunity to testify today before the House Subcommittee on Science, Research, and Technology and the House Subcommittee on Transportation, Aviation, and Materials. I am Beth Marks, research biologist and chair of the Sierra Club's Antarctica Task Force. The Sierra Club is the oldest conservation organization in this country with over 550,000 members. Our primary goal has always been the preservation of the Earth's wild places. Antarctica is the Earth's last and largest wilderness.

The Sierra Club is committed to the protection of Antarctica's fragile environment and dependant and associated ecosystems. We are totally opposed to the development of Antarctica's mineral resources. Antarctica should be declared an internationally-protected area dedicated to science and other peaceful uses. CRAMRA is not what is needed: the United States Government should be working with the other Treaty nations to negotiate a system of comprehensive protection measures which will fully protect Antarctica's fragile environment and ecosystems. (Sierra Club's Policy on Antarctica is attached as Appendix 1.)

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National Headquarters: 730 Polk Street, San Francisco, California ... (415) 776-2211

I. BACKGROUND

As a research biologist I traveled to Antarctica to study the adaptability of the indigenous fish to its subfreezing waters. This experience alerted me to the fragility of Antarctica's environment, and how easily it can be impacted.

Antarctica is a continent of superlatives: it is the coldest, windiest, highest and driest. Temperatures of -35^{o} are considered warm summer days. Mean winter temperatures range from -40^{o} to -94^{o}; the lowest temperature on Earth, -127^{o}, was recorded in Antarctica. Winds of 200 miles per hour are not uncommon. Because of its hostile climate and remoteness it was the last continent to be discovered, the last to be explored, and so far the only continent to be spared the ravages of industrial development.

Antarctica has a land area of 5-1/2 million square miles: this is 10% of the Earth's land surface. The average altitude is 7000 feet. The icecap ranges from 2 to 4 miles thick, covers 98% of the continent and contains 70% of the world's fresh water.

Antarctica is still the world's most pristine wilderness: it has the cleanest air and water, and the quietest seismic conditions on Earth, which make it an ideal scientific laboratory especially for monitoring pollution trends and other phenomena of global significance.

The signers of the Antarctic Treaty (AT) in 1961 understood the value of setting aside this remote continent for peaceful cooperation for the furtherance of science. The Treaty was signed and ratified at the height of the Cold War. Yet the spirit of cooperation among the 12 signatory nations with diverse histories and political regimes was pervasive enough to overcome those differences which were helping to foster the Cold War in the rest of the world.

The AT was and is a remarkable document. It facilitated cooperative international scientific research by providing for the open exchange of scientists and data among the nations active in Antarctic research. It laid the ground for international peace by freezing all territorial claims and by prohibiting all military activities. The prohibition on nuclear testing and disposal of radioactive waste effectively set aside 10% of the Earth as the world's first nuclear-free zone.

II. The Convention on the Regulation of Antarctic Mineral Resource Activities

The Subcommittees have asked for our views regarding the 1988 Minerals Convention. We believe that the Antarctic, and the Antarctic Treaty System are threatened by the Convention on the Regulation of Antarctic Mineral Resource Activities (CRAMRA). CRAMRA sets out the rules and regulations whereby companies can lay claim to pieces of Antarctica for their own commercial benefit, in complete disregard for the fundamental use of Antarctica: as a nature reserve, land of science. CRAMRA provides exactly what the mining companies need in order to carry out their activities: guaranteed rights, secure tenure, and control of information. By permitting the exploitation of the Earth's last remaining wilderness the open, peaceful cooperation among nations will end as each nation turns its attention and resources to gaining the right to exploit a share of the continent's presumed riches.

A. Dangers of CRAMRA

1. Threats to the Antarctic Treaty System

CRAMRA is inimical to the AT. The Treaty sets Antarctica aside for knowledge and peace. The minerals regime circumvents these values in the name of commerce. The Treaty sets Antarctica aside as a global scientific laboratory. The dust and pollution that would result from mining would compromise Antarctica's pristine environment and with it the research that depends on an unimpacted environment.

CRAMRA will undermine the Antarctic Treaty System (ATS):

* The spirit of cooperation and openness between scientists, exchange of scientists between bases, and sharing of data will be threatened. CRAMRA's provisions allow companies to protect "proprietary information" which undercuts the basic tenet of the ATS of free exchange of information.

* Less money will be earmarked for scientific research unique to the Antarctic, or of global significance as the thrust of nations' research programs will be slanted to further mineral prospecting.

* A primary purpose of the AT is to prevent Antarctica from becoming the scene of international discord. To achieve this military activities are prohibited. Minerals development could pose a threat of militarization of the region; recent history has demonstrated that countries will go to great lengths to protect their access to resources. If a huge field is discovered, its sheer size would make it important strategically to

one or several countries. It is inconceivable that any nation strategically dependant on Antarctic resources would refrain from guaranteeing its access to those resources.

2. Threats to Antarctica's role as a global laboratory

The localized pollution created as a result of mining operations would jeopardize Antarctica's uniqueness as a global laboratory.

The near pristine nature of the region provides a baseline against which pollution in more populated regions can be measured. The ice cap acts as a global historian, maintaining records of past global environmental conditions. Bubbles of air frozen in the ice provide a record of the composition of the Earth's atmosphere, temperature, and concentration of greenhouse gases for the past hundreds of thousands of years. Industrially-caused and naturally-occurring pollution can be differentiated. Ice-core samples have allowed scientists to date the start of the Industrial Revolution, the first nuclear explosion, and when the Test Ban Treaty went into effect.

Antarctica is a unique laboratory for atmospheric research. It is critical to understand how the atmosphere works in order to devise a reliable way to forecast weather and climate. Fundamental to this is an appreciation of how the energy which drives the global weather system is acquired, stored and distributed. The International Geosphere-Biosphere Program (IGBP) has been established under the auspices of the International Council of Scientific Unions. According to the IGBP, "The polar regions are very sensitive to changes in the global environment and may act as warning signals to changes in the energy flux into our Earth and to changes in the atmosphere." Because Antarctica plays a key role in the energy balance of the globe its climate affects us all in some way.

3. Threats to the global environment

Indeed, Antarctica's vital role in influencing global climate, ocean currents, tides, and sea levels will be affected by mineral exploitation.

The Antarctic continent and surrounding Southern Ocean play critical roles in the Earth's atmospheric and oceanic systems. The Antarctic ice cap covers 10% of the Earth's land surface and contains 90% of the world's ice. This massive ice cap reflects 50 - 90% of the sun's energy and is a reason why the South Polar region is so intensely cold. While this cold air is transferred north by the atmosphere and oceans, the ice cap acts as a huge heat sink, causing warm northern air to move down its temperature gradient towards it. These two processes govern the global temperature gradient and global wind patterns. Any significant melting of the ice cap, from global warming, or from dust and

dirt created by mining activities, would affect the intensity of this temperature gradient, causing a change in the global weather and wind patterns.

Because of its thermal insulating properties, the annual sea ice helps to maintain a constant temperature in the Southern Ocean by greatly reducing the exchange of heat between the atmosphere and the ocean. By winter's end the area of the continent is effectively doubled (to ~20 million square miles) due to the extent of the sea ice, forming an extensive thermal barrier.

This constant temperature is a reason why the Southern Ocean is a major force in establishing global tides, currents and sea levels. When the southern extremes of the Atlantic, Pacific and Indian Oceans meet to form the Southern Ocean their properties are mixed. Global ocean circulation is formed when colder southern waters meet and sink below the warmer northern waters. Excessive holes in the sea ice caused by melting from pollution or drilling would allow a great amount of heat to be lost from the ocean--causing major climate and ocean current shifts.

Development of agriculture and industry throughout the world has resulted in a doubling of the concentration of CH_4 in the atmosphere and a 25% increase in the concentration of CO_2. Because the Southern Ocean is so cold it is able to absorb between 1/3 and 1/2 of the CO_2 emissions from the industrial world. CO_2 is very soluble in cold water, but much less soluble in warm water. Increasing the temperature of the Southern Ocean would obviously decrease the amount of CO_2 that could be absorbed.

This function as a "sink" for CO_2 and other greenhouse gases is more critical today than ever before. The global carbon cycle is regulated by the forests and oceans. The overwhelming destruction of the rainforests over the past several years has added a huge carbon load to the atmosphere. A concurrent decrease in the number of trees available to convert CO_2 to O_2 has increased the importance of the Southern Ocean in regulating the global carbon cycle. In the ocean about 30% of the CO_2 is converted by phytoplankton to O_2 through photosynthesis. Phytoplankton are extremely sensitive to oil and pollution. If many were impacted there could be a decrease in the amount of CO_2 converted in the Southern Ocean.

Scientists studying the upper atmosphere first noticed the annual depletion of the stratospheric ozone layer above the South Pole. Preliminary research on the effects of increased levels of ultraviolet radiation on marine phytoplankton indicated a decreased photosynthetic rate. Much more research is needed in this area. This depletion of the ozone layer has demonstrated how tightly interconnected Antarctica is to the rest of the world and how easily it can be impacted.

We are only beginning to understand which questions need to be asked to enable us to fully appreciate Antarctica's role in the global systems. We still have do not know when we have reached the point were impacts are irreversible.

4. Threats to Antarctica's ecosystems and environment

Mining will negatively impact Antarctica's fragile ecosystems and food chain. There is no environmentally-benign way to exploit mineral resources in Antarctica. Antarctica is the world's largest wildlife sanctuary, home to over 100 million birds, including seven species of penguins, and six species of seals. It is the summer feeding grounds for fifteen species of whales. The waters of the Southern Ocean are among the most biologically productive in the world; they support a unique, highly-adapted and specialized ecosystem.

These animals have successfully adapted to the sub-freezing waters due to the rich nutrients in these seas and due to the stability of the marine environment over millennia. Because of this stability the animals that have evolved have become extremely specialized in their adaptations to their environment, and to each other, and are especially sensitive to disturbances which go beyond the narrow range of changes that are naturally encountered. A consequence of living in the freezing waters of Antarctica is a low metabolic rate which does not permit a quick response to any stress, like pollution, in the environment. This energy-conserving measure has allowed these animals to adapt successfully. This is why a seemingly minor change can have major, perhaps fatal, consequences, and why there is no environmentally acceptable way to extract mineral resources without harm to Antarctica's fragile ecosystem.

This hugh marine ecosystem is unusual, as one krill species, Euphausia superba, the Antarctic krill, helps to support all the higher species, and is the major food supply for five species of whales, three species of seals, 20 species of fish, three of squid, and numerous penguins and other bird species. The dependence of so many predators on just one prey group is unusual.

Antarctica's food chain is unusual for a second reason as well. Normally a food chain contains a wide range of levels and relationships. It is this variability which gives it stability. In contrast, Antarctica's food chain is extremely short and tightly interconnected; thus an impact on any 1 member will spread quickly. Recovery from such destabilization or degradation would be very slow, if possible.

Nowhere in the world is there a greater contrast between the ecosystems supported by sea and by land than in Antarctica. The terrestrial ecosystem, restricted to a few rock exposures and

ice-free areas along the coasts, is largely barren and supports a sparse flora and fauna made up of very few species. Fluctuations in climate and temperature are extreme. These organisms have evolved mechanisms which have allowed them to survive in this cold, dry climate. Because they are so finely attuned to their environment they are extremely fragile and easily impacted. Recovery from any serious disturbance could take several decades or more. The terrestrial ecosystem is seriously threatened by the increasing number of people working in and visiting the Antarctic. The infrastructure necessary to support mineral resource activities would have severe negative impacts.

The simple terrestrial and aquatic ecosystems found in Antarctica are models which can be used to follow critical biological processes at both the population and community levels. Understanding the adaptation of organisms to the extremes of cold and isolation could have applications for cryotechnology (blood, sperm, food).

Antarctica's unpredictable weather and unique geography combine to make mineral resource extraction foolhardy and dangerous. Oil spills are inevitable. Severe weather and storms appear without warning. Hugh icebergs scour the ocean floor. The pack ice can be blown 30 miles in one day. There are active faults in the ocean floor, and the continental shelf is narrower and deeper than elsewhere in the world making placement of oil platforms both tenuous and highly hazardous.

Even the most stringent environmental regulations in the world cannot guard against human error or mechanical failure. What value would regulations, conventions or good intentions have when operators are confronted with winds of 200 mph or drifting icebergs miles long? Our advanced level of technology has not allowed us to avoid human error, and consequently severe ecological repercussions. The wreck of both the Amoco Cadiz and the Exxon Valdez, and the grounding of the Bahia Paraiso demonstrate the potency of human error and the fallibility of contingency planning.

An oil spill is inevitable and would destroy the members of Antarctica's fragile food chain. The consequences of an oil spill on wildlife are well documented, but in the Antarctic the dangers would be more severe and final.

Oil would coat the krill and phytoplankton, the base of the food chain. It would collect in their tissues and concentrate as it moved up the food chain. The low metabolic rates of the fish would not allow them to overcome the stress of the oil with which they come in contact, both ambiently and through ingestion of krill. Seabirds would get soaked with oil; the feather structure that keeps the plumage waterproof would break down and they would lose body heat and die of hypothermia. Ingestion of

oil while preening is fatal. The layer of blubber beneath the skin of marine mammals which helps prevent heat loss has a high affinity for oil. Oil is toxic to marine mammals causing abortions, and possibly death.

Noise from seismic blasting could interfere with the ability of both whales and seals to communicate and locate food, and shock waves can cause damage to their eardrums.

The dramatically increased human presence required to support mineral activities would increase competition for the limited ice-free land and lead to habitat destruction. Migration patterns of whales could be impacted when the number of vessels operating in the Southern Ocean increases substantially with the commencement of mining operations.

There are currently no regulations in place which specify standards of construction, equipment, or crew training--which makes a devastating accident very likely. These accidents will have incalculable, and probably irreversible, consequences for the fragile Antarctic ecosystem.

It will be impossible to return Antarctic waters to their natural state after a major spill. The logistics of a clean-up would present severe problems because of the large area, its remoteness and the severity of the weather. Access by air would be limited at best. The Bahia Paraiso is testimony to this, and this accident occurred at the height of the Antarctic summer and in calm seas. Stormy weather would delay clean-up and disperse the oil slicks. Oil would be difficult to ignite in the ice-clogged waters. If there is a blow-out, an uncapped well could flow for six months or more during the dark winter. An oil spill could be a biological hazard for years as oil would get trapped in the ice as it froze, to be released during thaws in subsequent summers. And in the freezing waters of Antarctica the rates of microbial degradation of oil are substantially decreased.

The impacts from hard-rock mineral resource exploitation are just as severe and damaging. Extraction procedures for mineral-ore bodies involve the use of poisons, including the introduction of heavy metals. Both the marine and terrestrial ecosystems are especially susceptible to these pollutants, which might prove to be fatal.

We submit that CRAMRA is a flawed document and will facilitate mineral development activities. As its name implies, this convention regulates mineral activities; the intent is not to ban them. The underlying assumption is that the technology will be developed which will permit environmentally-benign mining. We believe this is impossible based on the reasons previously stated.

B. Deficiencies in CRAMRA

There are many deficiencies in CRAMRA which can lead to harm to the environment. The Antarctic and Southern Ocean Coalition (ASOC), of which Sierra Club is a member, has written a critique of CRAMRA which we endorse. I will reiterate our position on several of these deficiencies:

1. Liability

It is unclear whether there will be liability for an activity that is earlier "judged acceptable" and allowed to take place, which results in an accident which severely impacts the environment. Based on the definition of "damage," it appears that if a Regulatory Committee has erroneously determined that an activity would not result in unacceptable impacts, the operator is not liable. It should be noted that after 6 years of negotiations a liability protocol has yet to be negotiated. It is stipulated, however, that there will be limits to an operator's liability. Liability must be unlimited and without exceptions. The exemptions listed are too easy a defense in the extreme Antarctic environment. Article 8 (4) states that an operator shall not be liable if damage has been caused by:

a. an exceptional natural disaster which could not have been foreseen. This tends to be the rule rather than the exception in Antarctica's hostile climate. As I stated above, Antarctica's severe weather dictates against any mineral development activities.

b. armed conflict or terrorism. We believe that minerals development could pose a threat to the demilitarized status of the region. Resources have been held hostage in less stable regions of the world; recent history has shown us that countries will go to great lengths to protect their access to resources.

Limits and defenses to liability are unacceptable: if the premise behind the Convention is to proceed in an environmentally-responsible manner then any damage to the environment carries the weight of responsibility and therefore liability.

2. "Damage"

The definition of damage to the environment is vague. It has been defined as "any impact on the living or non-living components of the Antarctic environment or associated ecosystems, including harm to atmospheric, marine or terrestrial life, beyond that which is negligible or which has been assessed and judged to be acceptable." What are the definitions of negligible and acceptable, and who is to judge if damage meets these criteria?

3. "Significant"

The term significant needs to be defined. It is the modifier used most often to limit key obligations and liability. Again, who determines what is significant?

4. There must be the possibility of a negative decision at the development stage of minerals activities.

Article 54(5) has been interpreted as requiring automaticity in granting the permit to mine once an operator has obtained a license to carry out exploratory activities.

CRAMRA does contain some strong environmental provisions which, could be applied to the other uses of Antarctica, and should be included in any comprehensive measures negotiated for the region.

C. Will Unregulated Mining Occur Without CRAMRA?

It has been stated that, without CRAMRA, unregulated mining will occur as a country could decide to begin exploration without a legal framework in place. It is highly unlikely, without the secure tenure, guaranteed rights, and control of information provided for in CRAMRA, that any country would attempt mineral development activities.

As soon as CRAMRA is ratified prospecting can begin, leading to the probability of a commercially-exploitable discovery. It would be much more difficult to regulate environmentally-benign mining when companies have begun to invest substantial resources into mining interests.

The argument for ratification states that with CRAMRA there is a moratorium on exploration and development until a consensus decision is taken by the Commission to open an area. The argument continues that without CRAMRA, a permanent ban on mining would not be enforceable. We believe that regardless of whether a moratorium or a ban were in place, if a government wanted to risk the entire Treaty System by breaking either a moratorium or ban, there would be virtually nothing that the other Treaty nations could do. The Antarctic Treaty has been so successful for 30 years because the Treaty nations recognize its value in maintaining peace anJ cooperation in the region, and facilitating scientific research. To go it alone would destroy the very foundation on which the Treaty is based, and with it the entire Antarctic Treaty System.

D. Implementing Legislation

We submit that, as a political matter, CRAMRA is effectively dead. Australia and France did not sign CRAMRA. There is every indication that they will refuse to ratify. Without the requisite ratifications of all claimant states CRAMRA cannot come into force.

In light of the stalemate, and in conjunction with Sierra Club's belief that CRAMRA is not what is needed, we do not feel that a discussion of implementing legislation is productive. Congress should not be focusing its energies on the Minerals Regime or on implementing legislation. CRAMRA takes the wrong approach: the United States Government should be working with the other Treaty nations to negotiate and ratify an environmental protection convention, or a system of comprehensive measures which will fully protect Antarctica.

I wish to highlight several important gaps which need to be comprehensively addressed in order to protect the Antarctic environment.

1. Compliance and Enforcement

A mechanism needs to be set up, or a regulatory body established, which would assure enforcement of, and compliance with, all environmental regulations established pursuant to the Antarctic Treaty.

Recommendations agreed to at the XV Antarctic Treaty Consultative Meeting addressed waste disposal, marine pollution, and environmental monitoring. Expeditious incorporation of these recommendations into the Antarctic Conservation Act would make them legally binding on all U.S. activities. We applaud the National Science Foundation's Environmental, Health and Safety Initiative, which is starting to address the issues of waste minimization and disposal, retrograding of wastes, sewage treatment, and environmental monitoring.

2. Liability

Sierra Club believes that liability should be strict and unlimited. Damage to the environment that results despite compliance to environmental regulations does not automatically eliminate the responsibility of mitigation, and restoration of the affected area.

3. Applicability of Domestic Environmental Laws

The United States has the strongest environmental laws of any nation. U.S. activities in Antarctica should be subjected, at a minimum to our own domestic laws. Sierra Club believes a full

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review should be conducted by appropriate agencies, including EPA, CEQ, and NOAA, to determine which laws apply to our activities in Antarctica.

4. Technology Standards/Prevention and Response Capability

Standards should be set (for vessels, fuel-storage tanks, and any equipment with the potential to impact the environment) to prevent or minimize the possibility of irreversible accidents. If the best available technology is not adequate to protect the environment of Antarctica the activity dependant on this technology would not be permitted. A response plan should be implemented which should include equipment and personnel needed to respond quickly to an accident.

5. Public Participation

A mechanism needs to be in place to assure greater access to and public participation in the meetings of the ATS. Notices, allowing sufficient response time for public comment, should be placed in appropriate journals. Public meetings should be held in advance of meetings in which the U.S. government will be taking a position.

6. Environmental Impact Assessment

Environmental impact assessments should precede the onset of any activity in order to determine whether the activity has the potential to negatively impact Antarctica's environment. If an assessment determines an impact might result, a more thorough environmental impact statement should be prepared, which would include the option of not proceeding with the planned activity.

Legislation currently in the Congress addresses these issues, and contains many important provisions to protect Antarctica's environment:

H.R. 3977, Antarctic Protection and Conservation Act of 1990, introduced by Representative Silvio Conte

H.R. 4210, Antarctic Environmental Protection, Cleanup and Liability Act of 1990, introduced by Representative Walter Jones

H.R. 4514, Antarctica World Park and Protection Act of 1990, introduced by Congressman Bruce Vento

H.J.Res. 418, Resolution on Antarctica, introduced by Representative Wayne Owens

S. 2575, Antarctica Protection Act of 1990, introduced by Senator John Kerry

S. 2571, Antarctic Environmental Protection Act of 1990, introduced by Senator Albert Gore

S.J. Res. 206, Resolution on Antarctica, introduced by Senator Albert Gore.

The Sierra Club is supportive of these bills. We hope that both chambers of Congress will move swiftly to ensure that protective measures become law during this Congressional session.

III. THREATS TO ANTARCTICA'S ENVIRONMENT

Antarctica is a global scientific laboratory of immense value. A pristine, unimpacted Antarctica is essential for the scientific research that is conducted in Antarctica.

We submit that the past 30 years have seen an exponential increase in the amount of human activity in Antarctica. This has caused severe environmental stress to, and negatively impacted, its fragile ecosystems.

Presently, a nation can only achieve consultative status by establishing an independent research base. This interpretation of the Antarctic Treaty has led to a clustering of bases in the limited ice-free areas along the coasts. These are the same areas where the infrastructure associated with mining operations will be based. Less than two percent of the continent is ice-free. Only a small portion of these areas are along the coast, and serve as home and breeding grounds for millions of penguins and other seabirds, and seals. Often construction of bases has required radical modification of the local habitat; some have been built in or near breeding or nesting areas, or have been built across the routes normally traveled by the seals or seabirds between these areas and the open water.

In order to minimize these environmental impacts Consultative status should be attainable if a nation shares a base or engages in a joint scientific project.

Disposal of wastes has been an ongoing problem. Dumping in open landfills has created unsightly scars across the face of Antarctica and interfered with the routes normally taken by penguins in their journey to open water in search of food. In landfills adjacent to open water, leachate has contaminated the waters. Sewage flushed directly into the ocean has also caused high levels of toxic chemicals to accumulate in the sediment. The waters of in Winter Quarters Bay off McMurdo Sound would qualify for Superfund status in this country.

Open pit burning has impacted the fragile terrestrial fauna, and can cause accumulation of toxics and metals in the food chain.

These practices are illegal domestically. The National Science Foundation contends that domestic environmental laws do not apply to Antarctica. We believe that all of our domestic environmental laws should, at a minimum, apply to all activities of U.S. nationals and the government in Antarctica. In many cases these laws should be strengthened to take into account the unique Antarctic environment.

Unregulated tourism can cause localized impacts on the terrestrial ecosystem. There have been documented cases of tourists walking in protected areas. This problem is not unique to tourism, however. Off duty personnel regularly visit penguin rookeries, and helicopter overflights are not uncommon.

IV. COMPREHENSIVE MEASURES

We submit that environmental impacts can only be minimized and ended through the negotiation of a **Comprehensive Environmental Protection Convention**, or an agreed set of comprehensive protective measures, which would fill the "holes" in the Antarctic Treaty System, and ensure the conservation of the Antarctic environment and ecosystems.

Recent events have called into question the adequacy of the Antarctic Treaty in protecting Antarctica's fragile environment, and maintaining it as a continent of international cooperation, peace, and science. The **Bahia Paraiso** is still leaking oil in the waters one-half mile from Palmer Station, while its captain has been exonerated of any wrongdoing. This same scenario is destined to occur again and again as long as environmental standards, and definitions of "mischief", vary from base to base.

A. "Gaps" in the ATS

James Barnes, counsel to ASOC, has prepared an extensive analysis of the "gaps" in the ATS, and the elements which should be included in any system of comprehensive measures to fill these gaps.[1] Sierra Club is in agreement with the views expressed in this analysis. Some of the "gaps" and measures to fill them include the following:

There is no analogue to an Environmental Protection Agency, nor is there the equivalent of an Infractions Committee to objectively ascertain violations of the rules and report on actions necessary to enforce those rules. The ATS has no mechanism to enforce its own rules and regulations; consequently there has been a history of non-compliance. There is no system of liability for activities now taking place, and no regulatory system. Rather, there is a wide range of interpretations based on each nation's views on what the various measures and codes

mean. There is also no Secretariat which could facilitate the many meetings held within the Treaty System, and provide a centralized document depository.

Comprehensive measures would apply to all human activity in the area south of 60 degrees South latitude, and to the area outside that latitude but within the Antarctic Convergence.

B. Components of Comprehensive Measures

1. creation of an institution with Treaty-wide environmental protection responsibilities;

2. creation of an inspection corps to carry out regular monitoring and inspection of activities;

3. agreement on a general system of liability for all activities in the region;

4. creation of a system of dispute resolution for all activities and institutions in the region;

5. mechanisms to assure full compliance with all pertinent national and international treaties, laws and policies concerning waste disposal, siting of new facilities, and other activities that harm the environment; and

6. development of a long-term Conservation Strategy for the Antarctic, developed in cooperation with IUCN and other environmental organizations.

The negotiation of a Comprehensive Environmental Protection Convention that established the Antarctic as a wilderness and scientific reserve is the best way to fill the gaps in the ATS. By opting not to sign CRAMRA, Australia and France have provided us with the opportunity to permanently protect Antarctica's environment and ecosystems.

The Sierra Club urges the United States to support the Australian/French initiative, and to provide a leadership role in negotiating a protection regime for the region during the special Consultative Meeting in Chile this November. The United States is a leader in environmental protection legislation. We have experience in enacting and enforcing environmental legislation. If we supported a ban on mineral development activities, many of the Treaty nations would follow our lead.

C. International and Domestic Support for a Comprehensive Protection Regime for Antarctica

There is much support for the Australian/French position to work towards the negotiation and ratification of a protection regime for the region, and for declaring Antarctica a "Nature Reserve/-Land of Science", or "wilderness reserve", where mining would be permanently banned. Belgium, Italy and New Zealand share this view. West Germany, Poland, and the Soviet Union may be reconsidering their positions on CRAMRA. The EEC recognized the importance of preserving Antarctica. In May, **The Interparliamentary Conference on the Global Environment** recognized the significant role that Antarctica plays in the global environment, and called on the parliamentarians to "grant Antarctica special protective status as a Land of Science, treaty park, and international wilderness area...to extend the current moratorium on mineral exploration and negotiate a total ban on exploration and exploitation of mineral and energy resources...and to negotiate a comprehensive environmental protection regime."

During the 1989 United Nations General Assembly debate on the "Question of Antarctica" the delegates voted overwhelmingly for an Antarctic World Park. The UN Resolution "urges all members of the international community to support all efforts to ban prospecting and mining in and around Antarctica and to ensure that all activities [are] for the purpose of peaceful scientific investigations and...ensure the maintenance of international peace and security in Antarctica...."

V. CONCLUSION

We must draw the line at Antarctica. There are two reasons to permanently ban mineral resource exploitation:

1) As I stated above, Antarctica plays a vital role in the world's atmospheric and oceanic systems. Degradation of its unique environment will have devastating consequences on global climate and sea levels, and ocean and wind currents.

2) We are all extremely aware that global warming is taxing the life-support systems of our planet. We need to decrease our dependence on and consumption of fossil fuels. They release CO_2 into the atmosphere when burned which precipitates global warming and the greenhouse effect. Instead of exploiting the very last sources of fuels, we need to seriously start developing alternatives to fossil fuels. We can start now, or in a few years after we have exploited and destroyed the Earth's last wilderness. The choice is up to us.

It is vital to preserve large areas of wilderness and maintain unmodified systems over large areas of the Earth. Antarctica is

our last great wilderness. Thus far it is the continent least impacted by humans and virtually spared the ravages of development and industrialization. The protection of Antarctica is vital to our soul and spirit. Its vastness and grandeur forces us to change our perspective from a universe which revolves around the human species, to one in which humans are part of a continuum, part of this global universe which we call home.

The value of Antarctica to the world is immeasurably greater than exploiting it for its mineral resources. It is a zone of peace, providing experience in international cooperation. It is the world's only truly demilitarized zone. It is the best place on Earth to monitor and learn about global weather systems, global warming, and ozone depletion. The appearance of the ozone hole above the South Pole has shown us how closely Antarctica is linked to the rest of the world and how easily we can impact it.

We have just begun to appreciate Antarctica's complex environment and its major contribution to the Earth's life support systems. Mineral resource activities would jeopardize the value of Antarctica to science, peace, education, and inspiration.

(1) Address by James N. Barnes, Counsel to the Antarctic and Southern Ocean Coalition, to the Nansen Institute, Oslo, May 21-23, 1990, Protection of the Environment in Antarctica: Are Present Regimes Enough?

SIERRA CLUB
POLICY

Antarctica

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recycled paper

The following policy on Antarctica has been adopted by the Sierra Club Board of Directors:

Whereas,

• Existing management for living resources of the Antarctic region comprises a confusing array of domestic and international law, regulations and commissions together with the traditional freedoms of the high seas,

• Interest in projected hydrocarbon resources of the Antarctic continental shelf has led to a consideration of mineral resource regimes by the contracting parties to the Antarctic Treaty,

• Scientists agree that the simple ecological structure of the Antarctic region is extremely vulnerable to disturbance,

• Relatively moderate changes in the abundance of particular forms of life could easily destabilize conditions for others, and recovery from such destabilization or degradation would be very slow,

• Antarctica is known to play an important role in the formation of weather and climatic conditions over half the globe,

• There are scientists who fear that man-made disturbances in polar regions — perhaps resulting from petroleum or mineral resource exploitation — might cause serious changes in the global climate, [and]

• Despite the fragile nature of the Antarctic environment, its importance for southern hemisphere climate and weather, and its unique collection of flora and fauna, there is no assurance that adequate environmental protection will be maintained,

The Sierra Club reaffirms its commitment to the protection of Antarctica and its dependent and associated ecosystems. We are dedicated to ensuring the primacy of Antarctica's wilderness values for science, peace, education, and inspiration. These values are of universal and paramount importance for mankind and the global environment. We urge that the unique Antarctic environment be designated an international protected area where no mining can occur.

The Sierra Club supports the following measures to protect the fragile environment of Antarctica:

1. Setting aside forever areas of land and water large enough to protect ecosystems of unique biological significance and natural beauty.
2. Ratification by the United States of the *Agreed Measures for Conservation of Antarctic Fauna and Flora.*
3. A ban on harvesting of living resources except for scientific purposes, until a management arrangement is developed, based on

an assessment of its effect on the total Southern Ocean ecosystem. Exploitation under existing agreements (e.g., Antarctic Seal Convention and the International Whaling Commission whaling quotas) should be included in determining this assessment.

4. The continued agreement under the Antarctic Treaty prohibiting the disposal of radioactive wastes. Extension of the prohibition to include any highly toxic or long-lasting wastes.
5. The continued agreement under the Antarctic Treaty prohibiting all military activities.
6. Strengthened and continued strict control of all scientific research and an open exchange of information.
7. Limited tourism and its careful management so as to avoid pollution and damage to the Antarctic environment.
8. Increased public participation in the decision-making process on Antarctica, including the establishment of an advisory committee on which environmental interests are represented.

Adopted May 7-8, 1977
Amended March 17-19, 1989
Policy Code 5.2.2

Mr. TORRICELLI. Mr. Barnes.

STATEMENT OF JAMES N. BARNES, THE ANTARCTICA PROJECT

Mr. BARNES. Thank you, Mr. Chairman. At the outset I would like to endorse what Beth Marks has said. I think that was an excellent overview of what the environmental community in general believes about the situation we are discussing today.

Today I am testifying on behalf of 10 major U.S. groups that have more than 5 million members in the U.S. I also serve as counsel to a coalition called the Antarctic and Southern Ocean Coalition, which has as members more than 200 major groups in more than 40 countries around the world.

This coalition has tried to monitor what the governments are doing at their various international treaty meetings since 1978, when the coalition was first set up. I would say that over the years we have been monitoring what's been going on, we have always had a vision. The vision was the one that Beth has just laid out.

All through the 1980s, when the negotiations for CRAMRA, the Minerals Convention, were going forward, we did, in a sense, participate in arguing with the governments about details, and we put forward draft after draft of alternative language to try to make the Minerals Convention a better instrument. I think, in fact, it is a better instrument as a result of our endeavors.

But overall, we kept saying, "This is not the right approach; this is the wrong direction to be going." Interestingly, over those same years, we began to see things like ozone holes opening up, and the first serious understanding of global warming emerged. I guess what I would like to suggest at the outset today is that the world really has changed dramatically since the governments set out on the minerals treaty course at the beginning of this decade.

Now we would like to see Congress help adjust the vision of our Administration so that they really can be a leader in looking to the future of this region. I think as we look at this meeting coming up in Chile at the end of this year, this is really a grand opportunity. A lot of things could happen if the will amongst the governments materializes.

I would like to talk a little about the dynamics of the situation, politically, on an international level, just to give you some of the flavor here. As Beth noted, with Australia and France having signalled in numerous ways during the last year that they are not going to participate in CRAMRA, effectively CRAMRA is dead. If they adhere to that position, if they persist in taking that position, then there is no way CRAMRA can ever come into force. That would be a piece of political reality that all countries, including the United States, have to take account of.

Just in the last few days, New Zealand, another claimant state, seems now to have finally made up its mind what it is going to do, and it is going to turn its back on CRAMRA—to leave it on the shelf, so to speak, in an unratified state, and to work for a long-term moratorium, as they have announced it.

We know that Germany, another key player in this game, has been working for months behind the scenes, promoting what they would see, in fact, as a proposal that could restore consensus to the

treaty system. They are promoting a very long-term moratorium, on the order of 50 to 99 years, which would be enacted as a protocol to the treaty, so it would be fully legally binding and enforceable, and also to leave CRAMRA on the shelf, just waiting for some other generation, perhaps in 50 or 100 years, to take it down and see if it makes any sense then. But to take it off our list right now.

I think there are other great benefits to that kind of approach. If we can discover a solution to the minerals dilemma within the next year, I think we can then focus a lot more clearly on what we mean by comprehensive protection on all other levels.

Right now, as we can see from the Assistant Secretary's statement this morning, there continues to be quite a lot of nervousness about what the Australians and French have proposed because their comprehensive environmental protection proposal does embrace, in a number of respects, the idea of a ban on minerals activities.

So I think it does make it somewhat difficult for some governments, apparently, to understand what really is meant by comprehensive measures when the ban on minerals is sitting there right in front of them in the same context.

In short, what the groups that are part of our coalition—here in the United States, by the way, we have formed a new overarching group called the Alliance for Antarctica, which picks up a few groups that are not formally part of the Antarctic and Southern Ocean Coalition. We have been calling for the Secretary of State, in our formal letters, and in our meetings with Department officials, for some months now, to undertake a comprehensive review of U.S. minerals policy, and to end up rejecting as a pillar of that policy any maintenance of so-called minerals options.

I was interested a few minutes ago to hear Mr. Bohlen say that he doesn't read the current NSC documents as directly supporting this minerals option. The way it is worded is to give U.S. companies a fair go, apparently, if the area ever is opened up. But in practical terms, I think, what it has translated into is the maintaining of a minerals option. And that is how it is certainly perceived by other governments around the world.

What we are suggesting is that Congress can play a major role by taking the bills that are on the table in both the House and the Senate and dividing them into two piles, one bill in each chamber, focusing on the minerals question. If Congress agrees with the environmental community, which we hope it will, that the future of Antarctica should be devoid of minerals activity, then passing these bills as they are being developed will give the Administration some very clear directions as they move toward the meeting in Chile.

Then, on the other track, we need to look very carefully, I think, at all of the various aspects of comprehensive protection. It is very complicated to look at various things, from how do we stop the proliferation of scientific bases on the peninsula, for example, or on King George Island. Right now, if a country wants to build a base, it builds it anywhere it wants to. That's a different kind of question, though, than dealing with tourism. Every human activity that we want to talk about regulating requires a little different approach.

Australia's proposal is to have a convention which would lay out the principles for evaluating and regulating all activities, and to set up new institutional mechanisms, new arrangements, that would facilitate different kinds of decision making. Along that line, the environmental groups that I work with have actually been drafting a model comprehensive protection convention. We are almost done with that effort, and would be very pleased to share it with the Congress, if you are interested in it. We intend to put it on the table in Chile as an information paper which will then be available to all member governments.

We think we have gone further at this point than any other government, including Australia and France, in articulating through this model convention exactly how comprehensive protection might be carried forward.

I want also to touch on a couple of points that Beth mentioned, the wilderness and science values. I really think that these are very important. The wilderness values that Antarctica provides, if we are smart, if we draw the right lines, will be seen by future generations as one of the great strokes of wisdom that policy makers manage to come up with in the waning years of the century. On the scientific side, there are very, very profound reasons, all about the future of the planet, really, and our understanding of what we are doing to the planet and the atmosphere, and so on, for being scrupulous in maintaining Antarctica in as pristine a condition as we possibly can.

I wanted to note particularly one program called the International Geosphere-Biosphere Program, which is an international, scientific, decade-of-the 90s type program that has been initiated by the International Council of Scientific Unions, ICSU. It sees Antarctica as being a key platform for globally significant research on what is happening in climate change terms, and so forth.

We urge the Congress to look carefully into the funding needs of this IGBP program, and to give the scientists what they need in terms of economic resources, ships and the other equipment, so that this IGBP can be a big success in the 1990s. And so that when decision makers are sitting around the table in the early years of the next century, they will have a lot more information to understand how we are changing this climate and what needs to be done to stop it.

The potential of Antarctica for this kind of science, I think, is far from being fully utilized, and there are quite a few reports that are available to Congress that outline in great detail how Antarctica can be used as a platform in a variety of ways.

One interesting idea that Dr. Wilkniss has talked a little bit about in some other forums is to build an international base, a truly international base, not a U.S. base, not a Soviet base, but an international base, up on one of the high plateaus, where certain kinds of research could be done cooperatively among nations, and complete the model that we began with the Antarctic treaty.

I think, if we had more international bases, we would have less interest on the part of individual nations in building new bases.

The last thing I want to reiterate is that the environmental groups that are associated with this testimony, and indeed the entire coalition of ASOC, is going to oppose ratification of

CRAMRA in the United States and in England and in any country where it comes up.

We think, as we have outlined in some detail in this testimony and in great detail in prior statements to Congress and other analyses—we think it is the wrong treaty, not just because it might lead companies to invest in prospecting, although we are pretty certain that's what would happen there, but on its own terms, on the merits. We don't think it will protect the environment if they ever tried to use it for regulating minerals activities. I will not go into detail on that, because it is laid out in my statement.

We thank you for the opportunity to be here today, and look forward to working closely with the Congress in the rest of the session.

Thank you.

[The prepared statement of Mr. Barnes follows:]

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July 12, 1990

STATEMENT OF JAMES N. BARNES

to the

HOUSE SUBCOMMITTEES

on

TRANSPORTATION, AVIATION and MATERIALS

and

SCIENCE, RESEARCH and TECHNOLOGY

of the

COMMITTEE on SCIENCE, SPACE, AND TECHNOLOGY

concerning

ANTARCTIC MINERALS POLICY

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Appendix 1: ASOC Information Paper on a Comprehensive Conservation Convention

Appendix 2: Letter to Secretary Baker, February 12, 1990

Appendix 3: Australian-French Paper on a Comprehensive Regime for the Protection of the Antarctic Environment

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Introduction

I am James N. Barnes, Senior Attorney with the Environmental Policy Institute, Friends of the Earth and the Oceanic Society. Last year these three organizations merged to form a new global advocacy organization, which has 38 international affiliates. I also serve as general counsel to the Antarctic and Southern Ocean Coalition (ASOC), and as Executive Director of The Antarctica Project, a non-profit organization in Washington, DC.

The Antarctica Project serves as the northern hemisphere secretariat for the Antarctic and Southern Ocean Coalition, which includes more than 200 environmental and conservation organizations in 48 nations around the world. ASOC members are strongly committed to the full and permanent protection of Antarctica as a wilderness, wildlife, science and peace sanctuary of unparalleled scope. We stand in unanimous opposition to any mining or oil drilling in the fragile Antarctic environment.

This statement is presented on behalf of The Antarctica

Project, Environmental Policy Institute, Friends of the Earth, The Humane Society of the U.S., National Audubon Society, National Parks & Conservation Association, National Wildlife Federation, Oceanic Society, Sierra Club Legal Defense Fund, and The Wilderness Society. I am also here on behalf of the unrepresented wildlife of the Antarctic. We are pleased for the opportunity to present this testimony. Evelyn M. Hurwich, Associate Director and Counsel to The Antarctica Project, helped prepare this statement.

I. Summary

The international debate in legislatures around the world about what to do with the Minerals Convention has focused attention on the implications of ratification, and alternatives that would close the region to minerals development. This debate also has helped focus attention on what are termed "comprehensive environmental protection measures".

The Subcommittees have asked about the Special 1990 Consultative Meeting of the Antarctic Treaty Parties, to be held in Chile from November 19 to December 9, the first ever held on comprehensive environmental protection measures. On the table will be a number of far-reaching proposals from member governments, as well as the proposals of NGOs. As is well known, several governments have proposed a permanent ban on all minerals prospecting, exploration and development as part of an overall approach to comprehensive protection. Australia and France have taken the lead in putting forward that proposal, which the U.S. opposes.

We strongly support the proposal for a permanent ban. Given that the Antarctic Treaty System requires consensus in order to reach decisions, the proposal being promoted by the FRG for a very long-term moratorium on all minerals activities, with CRAMRA left lying on the shelf without being brought into force, is a promising development.

It is desirable to deal with the minerals question as soon as possible. If it were possible to agree, for example, on a 50-99 year moratorium in Chile, that could allow governments to focus more clearly on the other "comprehensive measures" that are needed to ensure protection of the environment in the region.

The U.S., for example, has found it difficult to give credit to the ideas put forward by Australia, France, Chile and New Zealand, which have identified "gaps" in the existing system and begun to flesh out proposals for filling those gaps. That appears to be largely a result of U.S. opposition to the ban on minerals activities proposed by Australia and France.

The U.S. should formally give up maintaining its "minerals option" for the Antarctic. In this context, we urge that the Administration immediately undertake a review of existing policy

regarding Antarctic minerals. The National Security Council should remove the option of obtaining Antarctic minerals from the documents that provide basic guidance to officials negotiating on behalf of the U.S.

Turning to the question of "gaps" in the Treaty System, we note that there is no Antarctic equivalent to an Environmental Protection Agency. There is no institutional mechanism to objectively ascertain violations of rules adopted to protect the region, or to report on actions necessary to enforce those rules, or to address alleged infractions. The Antarctic Treaty System (ATS) lacks many fundamental elements of a normal regulatory system. Participation in Treaty meetings and other affairs is not fully open to non-governmental and inter-governmental organizations. Public accountability is sorely lacking.

The proposal by Australia and France addresses the need for protection and proper management of the Antarctic as a whole. Their joint proposal for the "urgent negotiation" of "a comprehensive environmental protection convention" would, if agreed to by the other member countries, lead to the protection of the region as a wilderness and scientific reserve. The approach outlined by Australia and France could lead to the establishment of the equivalent of an Antarctic Environmental Protection Agency, set needed controls on tourism, provide for imposition of liability covering all activities, require comprehensive monitoring programs, and establish enforcement and dispute resolution mechanisms.

We urge the U.S. to respond positively to the Australian and French initiatives regarding negotiation of a Comprehensive Environmental Protection Convention. Attached to this statement as Appendix 1 is an Information Paper published by ASOC that describes why such a convention is needed, what its principles might be, and what activities would be covered. We are in the process of drafting a Model Comprehensive Protection Convention, which will be submitted as an ASOC Information Paper to governments at the Special Consultative Meeting in Chile later this year. We would be pleased to share this with the Congress.

Congress should play a larger oversight role concerning U.S. activities and policies in the Antarctic. Human activities are increasing rapidly there, and adverse impacts of those activities are mounting. Congress has significant responsibilities regarding the formulation and implementation of U.S. policy in the area. It can also, through the appropriations process, provide the necessary resources for a balanced program that ensures U.S. leadership for the region and full compliance with our responsibilities as trustees for this area.

We ask that Congress support the Joint Resolution put forward by Senator Gore and Representative Owens. It is highly desirable that the Joint Resolution be formally approved by the Congress as soon as possible. We also welcome the bills introduced by Representatives Conte, Jones and Vento, and urge

that they be speedily enacted into law. Our recommendation is that, ultimately, two bills be pursued, one dealing only with minerals questions, and the other covering all other aspects of environmental protection and comprehensive measures. It would be desirable for a schedule of hearings to be established so that these proposals, which contain many excellent ideas, can be harmonized and passed by the Congress. In this context, Congress might consider a process involving more joint hearings in order to assure timely consideration.

II. Background

Antarctica plays a vital role in the earth's atmospheric and oceanic systems. Any major change in the Antarctic environment could have unpredictable impacts on the climates and environments of other parts of the earth. The region holds many secrets of the earth's past. It may be the best monitoring zone for global pollution, a vantage point from which to observe the degradation of the earth's natural systems, and hopefully their recovery. In this context, Antarctica provides a unique platform for carrying out research on climate change and other global phenomena.

Constituting about 10 percent of the earth's land and water area, the Antarctic region is a great wilderness. Its land mass of approximately 13.5 million square miles is mostly covered by an ice sheet up to more than two miles thick. Less than 2 percent of that land area is exposed, and provides critical habitat for over 100 million birds, including seven species of penguins, and millions of marine mammals.

The surrounding Southern Ocean is rich in planktonic species, and among the most biologically productive in the world. It is home to one of the earth's most unique, highly adapted, and specialized ecosystems. Its richness supports economically important fisheries and a number of endangered species of whales that migrate into it. Nutrients from the Southern Ocean are carried thousands of miles to other areas of the ocean. It also is the site of the Antarctic Convergence Zone, where colder waters of the Antarctic sink below the warmer waters of the Indian, Pacific and Atlantic Oceans, providing the environment for diverse and abundant forms of life.

The state of knowledge about Antarctic ecosystems is still rather limited. Thus, our ability to predict accurately the possible impacts of various human activities is commensurately limited. A central theme of all efforts for protection and conservation in the region is the need for greatly increased research on all aspects of Antarctic ecology. This type of research is an essential precondition for sound management policy and decision making.

III. Antarctica: A Wilderness Issue

Antarctica is a wilderness that must be preserved. The U.S. is a leader in developing the legal concepts for protecting wilderness. For example, the Wilderness Act of 1964 defines a wilderness as "an area where the earth and its communities of life are untrammeled by man...where man himself is a visitor who does not remain...and which generally appears to have been affected primarily by the forces of nature with the imprint of man's work substantially un-noticeable...."

One aspect of "wilderness" in the Antarctic is the status of animal populations. Antarctica has the largest populations of wildlife left in the world, tens of millions of marine mammals and birds that are free to migrate, feed and breed as they have for countless numbers of years in their natural state. If the whaling moratorium is fully implemented, Antarctica can be seen as the last great wildlife sanctuary in the world. We note that research is being done on Antarctic wildlife. There also are many reported incidents of base personnel harassing wildlife and disrupting their habitat or feeding activities. Our members are concerned that all Antarctic living organisms are treated humanely, in all their interactions with humans.

The Antarctic presents policy and decision makers with the opportunity for wilderness conservation on a hitherto unequaled scale. The world's largest terrestrial national park, in Greenland, covers only 0.7 million square kilometers, and the Great Barrier Reef Marine Park - the world's largest marine park - covers a mere 0.3 million square kilometers. The sheer size of the Antarctic, its remoteness, the lack of clearly defined national jurisdiction, and the benefits that would be promoted place the wilderness reservation of this region in a class of its own.

The ATCPs have had difficulty in formally recognizing the principle of protecting wilderness values in the Antarctic. But independent groups such as the International Union for Conservation of Nature (IUCN) have passed resolutions on this subject. For example, the 1981 Resolution on Antarctica of IUCN's General Assembly, at which many Antarctic Treaty members were represented, recognizes "the importance of Antarctica and its Continental shelf and the Southern Ocean for the world as a whole, particularly in maintaining the stability of the global marine environment and atmosphere, and the paramount importance to mankind of its great wilderness qualities for science, education and inspiration."

The present system of environmental controls over scientific, logistic and other Antarctic activities does not work to prohibit a particular base or airstrip that will adversely affect wilderness or habitat values. Even the newly adopted environmental assessment procedure is not binding on the parties in any meaningful sense, and it, of course, imposes only a

procedural requirement.

It should be noted that the ATCPs have established mechanisms for Specially Protected Areas (SPAs) and Sites of Special Scientific Interest (SSSIs), and have now agreed to new categories that will allow for multiple-use management. Few protected sites have been formally demarcated, however, and they are very small. The newly adopted Recommendations for new types of protected and management areas provide some tools that can be used creatively to address habitat and wilderness questions.

IV. Scientific Potential

At present, Antarctica is a global scientific laboratory of immense value. The near pristine nature of the region provides a baseline against which we can measure pollution in more populated regions. The information locked in its ice cap are helping us understand the climatological history of the planet. Many simple terrestrial and aquatic ecosystems found in Antarctica are available as models that can be used to follow critical biological processes both at the population and community levels.

Antarctica is of critical importance to research on ozone depletion and the greenhouse effect. The International Geosphere-Biosphere Programme (IGBP) has been established under the auspices of the International Council of Scientific Unions (ICSU). IGBP describes the importance of the polar regions in this way:

> The polar regions are very sensitive to changes in the global environment and may act as "warning signals" to changes in the total energy flux into our Earth and to changes in the atmosphere. The polar regions also act as global historians, maintaining records of past global environmental conditions within their permanent ice fields.

The IGBP is co-ordinating international research efforts in polar regions, focusing on prime indicators of global change: ozone concentrations, ice cores, polar ice levels, and polar temperatures. It is important that such phenomena be studied without interference from local sources of pollution.

The potential of the Antarctic for extremely important research on global problems is not being fully utilized. Our ability to manage and control increasingly varied and intense human activities and their impacts on natural systems is dependent on a much better understanding of the interactions of fundamental components of the global ecosystem. Depletion of the ozone layer, global marine pollution, long-range transfer of pollutants, and climate change phenomena require coordinated studies on a global, interdisciplinary, multi-institutional

basis.

These programs require increasingly sophisticated field instruments, research techniques, computers and satellite capabilities, which are beyond the resources of most nations and any individual research institution. In order to fully realize the benefits of increased understanding of the earth and its systems now open to us, careful long-term planning and allocation of financial and intellectual resources are required, as well as continuity of support for these large global research and monitoring programs.

V. Convention on the Regulation of Antarctic Mineral Resource Activities

Our position on the Minerals Convention (CRAMRA) is well documented. We have prepared an extensive legal analysis and critique of the Convention, which can be obtained from The Antarctica Project, here in Washington, D.C. We consider CRAMRA a flawed document in many respects. A summary briefing of our position against it follows.

A. What's Wrong With CRAMRA?

Let us take the arguments for CRAMRA one by one.

1. CRAMRA protects the Antarctic while fulfilling the wish of many governments to keep the mining option alive. We believe this is a shortsighted approach, and, on balance, we submit that CRAMRA does not advance the true interests of any government, particularly compared to to options that have been put on the table by Australia and France.

2. CRAMRA is a conservation agreement On the contrary, and as its name implies, CRAMRA would promote the likelihood of mining by its very existence. It would provide an international legal framework in which mining rights can be obtained. If CRAMRA were to come into force, prospecting can begin without a consensus decision of the Commission. Once this occurred, it would be virtually impossible to deter a determined mining state from proceeding.

3. Without CRAMRA there will be an Antarctic minerals free-for-all, and, in its absence, a country could decide to begin exploration without the legal framework in place. We maintain that without the necessary legal framework in place, any attempt to extract minerals would not be feasible either economically or politically. In the absence of agreed sovereignty in Antarctica, a private corporation would certainly need assured property rights before expending massive sums of money to extract minerals. An expert from the British Antarctic Survey has estimated that exploratory drilling and development would

cost US$1 billion. CRAMRA provides precisely what oil and mining companies need in order to carry out activities: guaranteed rights, secure tenure, and control of information. So, without the CRAMRA framework, it is highly unlikely that any company would be willing to risk the investment.

4. CRAMRA would provide valuable support to the Antarctic Treaty System. CRAMRA's provisions allowing companies to protect "proprietary information" would undercut a key feature of the Antarctic Treaty System, which is free exchange of information. It also would have a tendency to warp national research programs toward prospecting.

5. CRAMRA takes into account the concerns of environmental organizations. As a result of intensive lobbying, the treaty draft contains some sound principles, but it is still flawed in many specific respects:

- the Scientific Advisory Committee will be very weak, because the Convention requires Commission involvement in and control over too many of its activities;

- there is inadequate provision for a true review of important Regulatory Committee decisions by the Commission and even when a review is theoretically possible, the Commission is powerless to overrule a Regulatory Committee;

- the Convention does not provide for adequate review by Observers outside the treaty system. Given the role of Sponsoring States in preparing draft impact assessments, and the closed nature of the Regulatory Committees, this will pose a serious problem of accountability to the public, and will likely result in important, relevant information not being available to decision makers.

6. CRAMRA is ambiguous on many key points, including:

- **sufficiency of information.** A threshold requirement is that there be information adequate to enable informed judgments to be made. The text does not make clear whether a decision is required by the Commission as to whether "sufficient information" is available, nor does it contain a definition of what "adequate" and "informed judgment" mean;

- **liability.** The assignment of liability in case of environmental damage is fuzzy, and the convention would promote litigation to determine responsibility. It is unclear if there would be liability for an activity which was originally "judged acceptable" and was therefore permitted, but which later resulted in serious damage to the environment. The definition of "damage" and the Convention's liability provisions could lead to only limited liability. ASOC is particularly concerned that

should such an event take place, the operator may not be liable for even very serious impacts;

- although **"significant"** is the modifier most often used in the convention, to refer to limitations on key obligations and liability, there is no attempt to define the term;

- **the possibility of a "no" decision at the development stage.** ASOC has insisted that a Regulatory Committee and the Commission must have the authority not to issue a full-scale commercial development permit to a holder of an exploration license. But some governments interpret Article 54(5) as requiring the automatic granting of permits to mine or drill, once an operator has obtained a license to carry out exploratory activities. The Commission has no power to override a Regulatory Committee on this fundamental decision;

- **compliance and enforcement** capabilities of the Convention. There are serious questions about enforceability. When the Commission learns of activities that affect the implementation of the objectives and principles of the Convention or the compliance by any Party with its obligations, it does not have to notify Observers, nor is there any mechanism for informing the public;

- **requirements regarding public records to be maintained.** A Regulatory Committee is not even required to maintain a record of its meetings, nor must it report on those meetings to the Commission. Outside observers and the public will have no knowledge of discussions concerning compliance, nor will inspection reports be available.

B. Ratification of CRAMRA?

ASOC will continue to oppose the ratification of CRAMRA. It is simply the wrong approach to the Antarctic future, and we have little hope that it would actually protect the environment. The Antarctic Treaty System has proven to be a resilient set of principles, obligations and instruments. If CRAMRA is not brought into force, numerous other options to fill this "gap" are available and will be explored.

As officially stated by Australia and France, "mining in Antarctica is not compatible with protection of the fragile Antarctic environment." Last year, these two Antarctic Treaty member nations took heed of world public opinion and decided to support, and work toward, the implementation of what is in essence a World Park for Antarctica. They oppose mining activities in the Antarctic and have refused to sign the Minerals Treaty.

At present, U.S. policy is driven in part by a desire to maintain the option of obtaining minerals and oil from the

Antarctic. Ensuring the opportunity to obtain Antarctic minerals and oil may, at one point, have been a primary U.S. interest in Antarctica. Now, that interest should be balanced against the risks it poses to the other stated U.S. interests. We submit that the option of obtaining minerals and oil from Antarctica clashes with the other U.S. interests, is short-sighted, and should be removed as one of the pillars of U.S. policy in the region.

U.S. ASOC members and others have created the Alliance for Antarctica, and in that capacity have written Secretary of State Baker to urge that he initiate a formal review of U.S. Antarctic policy. The elements of present U.S. policy are spelled out in directives from the President and the National Security Council. As summarized in the Office of Technology Report, "Polar Prospects: A Minerals Treaty for Antarctica", those interests include

(1) maintaining the region as a zone of peace,

(2) preserving freedom of scientific research,

(3) preserving the Antarctic environment, and

(4) providing an opportunity for U.S. private industry to exploit Antarctic resources if and when it becomes feasible and appropriate.

The Alliance for Antarctica letter to Secretary Baker, which is attached to this statement as Appendix 2, urges that point number 4 be deleted--which would mean that the U.S. would give up its Antarctic "minerals option"--and discusses the U.S. position in preparing for the forthcoming meeting in Chile:

> Unfortunately, rather than actively supporting the far-sighted initiatives of Australia and France, State Department officials have thus far taken the position that a total prohibition on mineral resource activities "is simply not negotiable," in large part because the U.S. itself is said not to agree to such a ban. By embracing CRAMRA in the face of the Australian/French proposal, these officials have taken the position that "environmentally acceptable" mining as determined by the CRAMRA parties may take place in Antarctica.
>
> That position directly contravenes our firm belief that mining--including oil development--in Antarctica will never be environmentally acceptable. If such activities are permitted in Antarctica, they may result in tanker accidents similar to the Exxon Valdez oil spill and well blowouts with lethal effects on Antarctica's marine life. As the Bahia Paraiso shipwreck in

> Antarctica last year made clear, the region's harsh climate and ice-strewn waters make such oil spills virtually impossible to clean up. Air pollution from mineral activities would jeopardize Antarctica's unique role as a global environmental monitoring site.

It is also worth noting that the recent, first-ever Interparliamentary Conference on the Global Environment, which was sponsored by the U.S. Senate, strongly backed a permanent ban on minerals activities in the Antarctic. Delegates from 42 countries agreed to this Resolution:

> As Antarctica plays a significant role in the global climate system and the aquatic food chain, [governments should] provide comprehensive and effective protection of the Antarctic ecosystem by:
>
> - granting Antarctica special protective status as a Land of Science, treaty park, and international wilderness area;
>
> - extending the current moratorium on mineral exploration and negotiating a total ban on exploration and exploitation of mineral and energy resources in Antarctica;
>
> - adopting specific environmental protection measures until a comprehensive environmental protection regime can be negotiated to control tourism, waste disposal, oil spills, research activities, and to extend protected areas...

C. Filling The "Minerals Gap"

If CRAMRA is not coming into force, the question of the present informal and conditional moratorium must be addressed. This "policy of voluntary restraint is part of the Final Act of the Minerals Convention. By its terms, it remains valid only so long as "timely progress" is being made toward ratification of CRAMRA. Moreover, its legal status is extremely tenuous, given its position in a Final Act of an unratified treaty. Even its wording is suspect: governments are only urged to keep their nationals from carrying out mineral activities.

Informal proposals now are circulating among governments about how to extend and strengthen the moratorium, and to de-link it from the ratification condition. They should be seriously addressed at the Special Consultative Meeting in Chile this November.

One proposal that has merit is to establish a long-term or

indefinite moratorium as a free-standing Agreed Measure, pursuant to Article IX of the Antarctic Treaty, or as a Protocol to the Antarctic Treaty. The FRG is actively pushing for a long-term moratorium on all minerals activities--including prospecting. New Zealand has recently indicated its support. Both governments would leave CRAMRA on the shelf, unratified, for a future generation to consider.

Utilizing an Agreed Measure or a Protocol would provide formal legal status, and a mechanism for reconsidering the moratorium in the future, should that ever become necessary. Our suggestion would be that such a moratorium be lifted only by consensus. That approach also leaves open the question of including an article banning minerals activities in a new Comprehensive Environmental Protection Convention. Such a convention is likely to take several years to negotiate, assuming there is the requisite political will to begin the effort.

Without U.S. leadership in helping to negotiate a permanent ban or long-term moratorium on minerals activities and a comprehensive regime to manage other human activities in the Antarctic, there will be a stalemate. If the U.S. agrees to support these initiatives, other major countries such as the U.S.S.R., Japan and the U.K. will most likely agree to that approach. Domestically, there is no organized constituency in favor of CRAMRA. Industry is at best tepid on the subject of the Minerals Convention. The general public would be very supportive of the U.S. taking these steps.

Assuming that Australia and France adhere to their present positions, CRAMRA could not, in any case, come into force. The political reality is that CRAMRA is effectively dead. What is now needed is to find a solution to restore political consensus within the Antarctic Treaty System. The United States has the potential to play a critical leadership role in this regard, but to date it would be generous to call that potential merely "underutilized". As Senator Al Gore so aptly put it as far back as December of 1988 in an article that appeared in The New Republic, "The real question is whether the world's political system can find a new equilibrium before the world's climate system loses its current one."

President Bush, while asserting his environmental credentials, has not demonstrated leadership in putting forward a strong environmental agenda for the Antarctic.

VI. Comprehensive Protection Initiatives

At the onset of the Fifteenth Antarctic Treaty Consultative Meeting (ATCM) in Paris four proposals regarding "comprehensive environmental protection" were on the table, and a fifth was tabled later in the meeting by Sweden, purporting to define the

common elements of the others. The original four were submitted by Chile, New Zealand, the U.S., and France/Australia.

Chile led the way in calling for the negotiation of comprehensive measures and in calling for the convening of a Special Consultative Meeting for this purpose. Their proposal suggests that comprehensive measures be designed to improve the existing framework and "perfect the existing provisions". It emphasizes the protection of "the Antarctic environment and its dependent and related ecosystems as the fundamental criteria for deciding the activities in the Antarctic".

New Zealand acknowledges that existing mechanisms are inadequate and proposes comprehensive standards to apply to all forms of human activities. Their proposal also acknowledges the need for infrastructural support and institutional involvement in information gathering and compliance.

The U.S. proposal is the weakest, calling only for a "program of work" toward improving comprehensive environmental protection within the Antarctic Treaty. It states "Parties have shared a commitment to see that all human activities in Antarctica are conducted so as to avoid adverse impacts upon the Antarctic environment" and goes on to say there is "a need for continual revision and extension of the existing network of environmental provisions as the ambit and scale of human activities grows." The proposal is, in effect, a status quo approach calling for new measures which build on existing components of the Antarctic Treaty System when seen to be needed. The proposal emphasizes three areas of consideration:

- effective standards and procedures to be applied to "all" activities (defined as those not covered by other Treaty instruments);

- clear and enforceable obligations, and

- mechanisms to ensure effective and consistent implementation.

The Australian and French proposal for the negotiation of a Comprehensive Environmental Protection Convention would lay a foundation for regulating human activities in light of the important values to the world community of keeping Antarctica as pristine as possible. A recent paper from these two governments on the components of such a comprehensive regime is attached as Appendix 3.

The groups joining in this testimony support achieving the permanent protection of the region through the negotiation of such a comprehensive conservation convention. It would provide principles, policies, procedures and mechanisms to coordinate, manage and limit human activities in the Antarctic.

Such a convention would acknowledge the important role of

the Antarctic in monitoring global pollution, the use of the region exclusively for peaceful purposes, the unique aesthetic and wilderness values of the region as a part of the earth relatively undisturbed by humanity, and its increasingly substantial contributions to scientific knowledge.

In our view, the international and domestic implications of supporting the Australian and French initiative would be very positive.

A. Principles and Obligations

A conservation convention would include obligations to adhere to a set of principles against which all activity in the Antarctic would be judged.

Principles might be along the following lines:

1. The conservation and protection of the Antarctic region and its ecosystem require that

(a) no activity take place unless adequate information is available to enable informed judgment about that activity's possible impact on the Antarctic ecosystem; and

(b) based on that information, it is judged that the activity, by itself or in combination with other activities, will not directly or indirectly result in significant impact on Antarctic ecosystems, including:

(i) causing or contributing to any damage to the Antarctic atmospheric, terrestrial, fresh water, and marine environments and their associated ecosystems;

(ii) affecting global or regional climate or weather patterns;

(iii) disturbing atmospheric, terrestrial, fresh water, and marine ecosystems and their dependent or associated ecosystems beyond the area of this regime;

(iv) jeopardizing the continued existence or the recovery of any species or population that is currently, or is likely within the foreseeable future, to be in danger of extinction; or

(v) adversely affecting unique biological communities or areas of special biological, scientific, historic, or

aesthetic importance.

2. In judging the potential impact of human activities, full account shall be taken of

(a) the vital influence of Antarctica on the function of global ecological, oceanic, and atmospheric circulation systems;

(b) the vulnerability of the Antarctic environment and its associated and dependent ecosystems to human modification;

(c) the need to provide for conservation of natural ecosystems and physical processes, on land and at sea, including rare and endangered species and populations of plants and animals;

(d) the requirement for conservation of the biological diversity of the region;

(e) the need to protect the special scientific, natural, historical, aesthetic, and wilderness landscape values of the region;

(f) the need for any conservation plan to be continually reviewed and updated to take account of changing knowledge or circumstances, and to be resilient in the face of foreseeable environmental changes, such as global climatic warming and associate sea level rise or ozone layer depletion; and

(g) the importance of ensuring continuation of scientific research, cooperation and the maintenance of peace and international stability in the Antarctic region, within the Antarctic Treaty System.

B. Institutional Arrangements

In order to achieve the principal purposes of such a Convention, the Parties should agree to establish rules and institutions to help carry out the following sorts of tasks:

(a) assess the significance of impacts on the environment of human activities in the Antarctic region;

(b) determine which activities are acceptable and the conditions under which they may be carried out;

(c) monitor and report on such activities that are

found acceptable;

(d) provide a means to review any ongoing activities to ensure continued compliance with the objectives, principles, and requirements of this Convention;

(e) ensure that any Antarctic activities are undertaken in strict conformity with the Antarctic Treaty System, the measures in effect under that system, and its associated legal instruments and this Convention;

(f) ensure that no activities that are deemed unacceptable are allowed to occur;

(g) ensure that any activities damaging the Antarctic environment or its dependent or associated ecosystems are discontinued;

(f) provide for liability and compensation for activities that result in damage to the Antarctic ecosystem;

(g) ensure that all persons, including private non-governmental organizations, are kept fully informed of planned activities in the Antarctic region and have the full and timely opportunity to submit detailed public comments to the persons or bodies planning such activities; and

(h) ensure that all papers, materials and discussions on Antarctic activities are publicly available in a timely manner.

The degree of involvement of the institutions vis a vis the individual country would vary depending on the scope and possible impacts of particular proposal. One can imagine that significant responsibilities would be maintained by individual states. The judgments described above would need to be based on environmental assessment procedures. In practice, many activities, particularly scientific research and minor logistics, would be judged by the national system established by each member country. But there would be much greater participation of other countries than at present in commenting on proposed activities that pose threats to the environment. And, for activities posing greater threats, there would be a role in decision making for interested governments. This is inherent in designing a true regulatory structure for the region.

New institutional arrangements would be needed so that assessments of activities that pose greater threats are carried out on an international basis, with participation of all interested member states and observers. These

environmental assessments should be based on information allowing the prediction, within a reasonable margin of error, of the normal operational impact of the activities in question, the identification of the nature and likelihood of possible accidents of environmental significance, a prediction of the impact of such accidents should they occur, the cumulative impacts of otherwise acceptable activities, and the thorough evaluation of alternatives, including the alternative of no action.

A periodic review process, effective inspection system, appropriate enforcement procedures, and dispute resolution would be required to ensure the integrity of such judgments. The fact that the ATCPs have negotiated a system for compliance in the proposed minerals regime, which has similar components, should make it possible to negotiate similar language in a conservation convention.

Ideally, a central coordinating body would be responsible for adopting appropriate regulations and guidelines relating to the operation of scientific bases, expeditions, transportation systems and tourism, and for effective waste disposal and marine pollution measures. The precise mix of obligations, responsibilities, powers and procedures would need to take account of the historical realities implicit in the Treaty System. With the advice of an expert environmental and scientific committee, the coordinating body ideally would:

- o review activities that require environmental assessment to determine the compatibility of the activity with the principles and objectives of the Convention;
- o request and review such assessments to be produced by others;
- o monitor compliance with its regulations through processes of inspection and observation; and
- o prepare reports and recommendations to governments.

VII. Recent International Developments

Some governments have responded favorably to the Australian and French initiatives during the past months, and there appears to be some momentum building. For example, President Gorbachev made the following statement at an international meeting in Moscow in January:

> The Soviet Union believes it is necessary to elaborate an international judicial system for the protection of

> exceptional natural zones which have planetary importance. The considerable thickness of the Antarctic ice layer makes it an inestimable reserve of the Earth's past, of its geological and ecological history. It is of significance that the Antarctic is the first denuclearized zone in the world and the first territory on this planet entirely opened to international scientific research. The Soviet Union shares the fears of many scientists and social personalities concerning the exploitation of natural richness's in the Antarctic. Our children will never forgive us for not having protected this extraordinary ecosystem. The USSR is ready to participate in the survival of the Antarctic, of this world reserve, which is our common natural laboratory.

Last week, on July 6, Prime Minister Geoffrey Palmer of New Zealand announced that NZ will be promoting the adoption of a Protocol to the Antarctic Treaty to deal comprehensively with environmental protection in the Antarctic, and will be working with other Treaty partners on a draft of such a protocol to be presented at Santiago:

"This Protocol would be the ideal 'umbrella' for the various steps towards the different types of environmental protection necessary for the problem areas in the Antarctic, such as waste disposal, oil spills, the effects of tourism, improved monitoring arrangements and environmental impact assessment procedures."

With regard to CRAMRA, he stated: "We have set it aside. I see no need to come back to it."

Regarding the moratorium: "At present the Treaty Partners only have a voluntary moratorium linked to the minerals convention....We give a much higher priority to getting a long-term, legally binding moratorium. We have therefore decided to push for one which is independent of the minerals convention."

Prime Minister Palmer also said that NZ would be taking a low profile at the Liability Protocol meeting on the Minerals Convention, to be held in conjunction with the main Santiago meeting.

Last month, at the Dublin European Council meeting of June 25-26, 1990, a declaration on the environment entitled "The Environmental Imperative" was adopted. The relevant paragraph on Antarctica reads as follows:

Global Issues

> The Community and its Member States have a special responsibility to encourage and participate in international action to combat global environmental problems. Their

capacity to provide leadership in this sphere is enormous. The Community must use more effectively its position of moral, economic and political authority to advance international efforts to solve global problems and to promote sustainable development and respect for the global commons. In particular, the Antarctic deserves special protection as the last great unspoiled wilderness. The Community should also support efforts to build into international structures the capacity to respond more effectively to global problems.

VIII. Role of the UN

At last year's annual debate on the "Question of Antarctica", the General Assembly voted overwhelmingly for an Antarctic World Park. This vote does not seem to have percolated into the public consciousness, perhaps because it was boycotted by most members of the Antarctic Treaty. During the debate, Malaysian representatives made the following statements:

> In our view, this global common, because of its unique characteristics and its significant impact on world climate and ecosystems, must be accorded every protection against exploitation of its resources. In this connection the banning of prospecting and mining and the regulation of other activities related to the exploration and uses of Antarctica are key elements in the development of an international protection regime for Antarctica, which would render this last frontier as a world wilderness park.
>
> It would be for the benefit and in the interest of mankind to ban all prospecting and mining activities in Antarctica.

In New York on November 22, 1989 delegates accepted a draft resolution put forward by members of the Non-Aligned Movement to this effect:

The Resolution:

> URGES ALL MEMBERS OF THE INTERNATIONAL COMMUNITY TO SUPPORT ALL EFFORTS TO BAN PROSPECTING AND MINING IN AND AROUND ANTARCTICA AND TO ENSURE THAT ALL ACTIVITIES SHOULD BE EXCLUSIVELY USED FOR THE PURPOSE OF PEACEFUL SCIENTIFIC INVESTIGATIONS AND THAT ALL SUCH ACTIVITIES SHOULD ENSURE THE MAINTENANCE OF INTERNATIONAL PEACE AND SECURITY IN ANTARCTICA, THE PROTECTION OF ITS ENVIRONMENT AND SHOULD BE FOR THE BENEFIT OF ALL MANKIND;

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EXPRESSES ITS CONVICTION, THAT THE ESTABLISHMENT, THROUGH NEGOTIATIONS WITH THE FULL PARTICIPATION OF ALL MEMBERS OF THE INTERNATIONAL COMMUNITY, OF ANTARCTICA AS A NATURE RESERVE OR A WORLD PARK, WOULD ENSURE THE PROTECTION AND CONSERVATION OF ITS ENVIRONMENT AND ITS DEPENDENT AND ASSOCIATED ECOSYSTEMS FOR THE BENEFIT OF ALL MANKIND.

Since 1985 the ATCPs have chosen to "not participate" in the voting on UN resolutions relating to Antarctica (with some exceptions for the resolution addressing South African involvement). 1989 was no different:

85 countries voted "yes"
0 countries voted "no"
7 countries abstained
42 countries did not participate in the vote
23 countries were absent

In spite of the failure of Antarctic Treaty members to participate, this is a very positive development, which should help to allay fears that the interest in Antarctica of the Group of 77 less developed countries hinges on its exploitation potential. Because the Resolution calls for the full participation of the international community, it is not entirely consistent with the Australian/French proposals, but does provide a sound basis for resolving the long-simmering debate in the General Assembly.

IX. Conclusion

Antarctica is in delicate balance. Its creatures are uniquely adapted to the difficult conditions of the region and to one another. They cannot accommodate the significant changes that would invariably result from commercial mineral activities.

The ad hoc approach to comprehensive protection advocated by the U.S. would lead to continuing environmental degradation of this last great wilderness. That prospect is clearly unacceptable to the public.

We commend those governments which would take this step of setting aside Antarctica as a wildlife sanctuary beyond measure, a living science laboratory for all nations to use cooperatively, and as a permanent demilitarized zone of peace on Earth.

We call on politicians from all parties to ensure that governments take the best position in Chile.

Mr. TORRICELLI. Thank you.
Dr. Dalziel.

STATEMENT OF DR. IAN W.D. DALZIEL, SENIOR RESEARCH SCIENTIST, PROFESSOR OF GEOLOGICAL SCIENCES, INSTITUTE FOR GEOPHYSICS, UNIVERSITY OF TEXAS

Dr. DALZIEL. Mr. Chairman, thank you for the opportunity to testify to your committee.

I speak as an individual scientist, although I am the delegate to the Scientific Committee on Antarctic Research of the International Union of Geological Sciences, both of which fall under the umbrella of the International Council of Scientific Unions, just mentioned.

I would like to give you two areas of concern for the earth science community in particular, with regard to the current deliberations about CRAMRA and the future of the Antarctic. Let me first of all add a little bit of perspective in front. There is a big difference for the scientific community between CRAMRA and the Convention for Marine Living Resources in the Antarctic. In the case of the Living Resources, a large proportion of the scientists working in the Antarctic study those resources and are very familiar with them. So when we came to consider an international convention for their protection, there was a large body of scientific evidence behind setting up that convention. Antarctic minerals, by comparison, is a non-subject. There are no known commercial deposits in the Antarctic, as you have heard. Nobody in any detail has been there for studying economic deposits in the Antarctic. There is only one country that I am aware of that actually employs a specialist to look at the possibility of economic deposits in the territory which is the subject of their particular national claim.

If I could, I would just like to clarify a few points with regard to earlier testimony you have heard concerning minerals. One is that I think you need to be aware that we are not just talking about a Texaco or an Exxon needing world class oil deposits to want to exploit an Antarctic oil basin. If you were dealing, for example, with Chile or Argentina, which import a very large proportion of their oil, as in fact we do now, you might find that you are not just dealing with a price per barrel. You are talking about how much of your national oil supply you can get out of an area that you claim.

In fact, the Larsen Basin, off the northern tip of the Antarctic Peninsula, has been studied rather extensively by British Antarctic Survey scientists, and written up in Marine and Petroleum Geology with specific plays for looking for oil. It is well known that the source rock is there to provide that oil. All you really need is the reservoir rock that traps it, and you have a potentially major oil deposit. This was a continuation of the basin in southern Chile and Argentina before the opening of the Drake Passage.

The other point for clarification is with regard to metallic minerals. One might compare the situation in the Antarctic with that in Greenland a year ago. In the last year in Greenland, we have now found major gold deposits in a place which nobody would have thought to look for them before, namely in the Skaargard Massif. The Dufek Massif in the Antarctic is a very similar body. If I was

working for a mining company and had a real interest in the Antarctic, that's where I would go to look. That is in the interior of the continent. We are not talking about an area where you would have to drill through thousands of meters of ice to get to the rock. Those are just two things I wanted to make a little clearer from earlier testimony.

The areas of concern that the scientific community had particularly with regard to the well-meaning, but nonetheless, in my view, devastating, approach that might be taken if we say we don't want to do any geophysics in the Antarctic, and we don't want to drill there. Geophysics and scientific drilling are essential if we are going to understand the palaeoenvironment of our planet.

Antarctica is part of the world's global dynamic system. It is one major continent and one of seven major plates. It interacts with all the other plates in the world. For example, our understanding of the Antarctic continent even contributes to our understanding of what is happening along the west coast of North America, along the San Andreas fault region today. It is also critical, obviously, from a palaeoenvironmental point of view. One thing that the earth scientists contribute to global climate change, and this IGBP program which was referred to, is a perspective on what has happened in the past in our climate. These changes that are taking place—where do they lie in the range of changes that have taken place in the past?

The one concern that we have is that restriction might be placed on techniques that are used to study the Antarctic, and those techniques may be critical for understanding the continent in its global context and its palaeoenvironment.

I will conclude my testimony with one overhead, just to illustrate the type of program I am referring to. Secondly, an area of concern is that enabling legislation for CRAMRA, if it is enacted, could burn up all the resources we have for doing basic science. If, for example, Congress were to decide that out there we have a continent, we know very little about it, as I have said we know of no economic deposits at the present time. If we were to conduct base level surveys, aeromagnetic studies all over the continent, etc., we would very quickly burn up the existing resources, and logistics, particular logistics. Even if new money were to be available, there is a very limited amount of logistic support. And without the supply of new aircraft, ships, and so on, very soon we would have no resources left to do basic science, problem-oriented science, as opposed to very basic surveys.

The type of program I am concerned about is one, for example, that the international community, the Scientific Committee for Antarctic Research, has recently put before several countries, the U.S., the Soviet Union, the United Kingdom, West Germany, and New Zealand, and would involve a seismic line across segments of the entire continent over the long period of time. This would involve seismic work and eventually, I envision that it would involve drilling. I certainly don't want to be seen as being responsible for despoiling a continent any more than I want to be seen walking away from a dirty campsite in a national park. And I can assure you that if we are able to bring this sort of project into being, that we will conduct it in a very responsible fashion.

Nonetheless, there is the potential, both in overzealous regulation of what could happen in the Antarctic, and of using up all available logistics for the base level surveys to understand minerals and the presence of minerals in the Antarctic, of precluding this type of science.

This is a picture of the Antarctic continent with the ice removed. The line across the middle of the continent the Antalith Geotransect or Antarctic International Lithosphere project, has been singled out by the international earth science community as embracing several different scientific problems that are beyond the capability of any one country to address.

It includes the Byrd Subglacial Basin, which is shown in that rectangle on the left. The Byrd Subglacial Basin, as you can see from that map, that diagram of the Antarctic, may well have been a seaway of oceanic depth through the continent before the Ice Age, before glaciation. It is therefore critical in our understanding of circulation in the ocean and of the longer term palaeoenvironmental development of our Earth.

If somebody were to say to us, "Well, you cannot do any seismic work in the Antarctic," there are problems of great magnitude that would be left unaddressed.

Thank you very much.

[The prepared statement of Dr. Dalziel follows:]

Ian W.D. Dalziel *is Senior Research Scientist and Professor of Geological Sciences in the Institute for Geophysics of the University of Texas at Austin, and a former Chairman of the Department of Geological Sciences at Columbia University's Lamont-Doherty Geological Observatory. He has worked in the Antarctic since the late 1960's, and is currently Delegate of the International Union of Geological Sciences to the Scientific Committee on Antarctic Research He testifies as an individual scientist.*

I was invited to testify before this Committee with regard to the potential impact of the ratification of the Convention for the Regulation of Antarctic Mineral Resource Activities (CRAMRA) on science in the Antarctic. The national and international debate about CRAMRA, however, has broadened enormously in recent months. It now embraces proposals for comprehensive measures to protect the Antarctic environment (with or without a specific minerals convention), and the idea of creating an Antarctic "world park." I shall, therefore, with the Committee's permission, take the liberty of broadening my mandate to briefly consider the potential impact of various proposals that have been put forward with regard to the future of Antarctica. As a geologist , I shall mainly draw on the earth sciences to illustrate my point,, but my conclusions apply to all fields.

The Committee should be aware at the outset of my personal point of view concerning the future of Antarctica. I believe that it is extremely important from standpoints for us, and by "us" I mean the people of this planet, to protect the Antarctic both as an extremely significant, indeed critical, segment of our environment, and as a unique wilderness. The environmental significance is well known to you, and I need only mention the depletion of atmospheric ozone in the Antarctic and the sea level rise that would result from melting of the ice cap in order to highlight the point. With regard to wilderness, Antarctica is the only continent on earth where a human being is absolutely dependent for survival on imported materiel. I am sure that several members of the Committee have visited the continent and various US and foreign bases there. They will have some idea of what I am talking about. I can assure you all, however, that the feeling of isolation and critical dependence on your protective clothing, tent, and meager food supply are immeasurably heightened when you are being left in the continental interior for two months with a handful of companions and allow your mind to dwell on the fact that there is absolutely no way that you can survive if the aircraft does not return. As a child I was engrossed, thrilled, and challenged by the story of the first crossing of the continent by Vivian Fuchs and Edmund Hillary. After nearly 25 years of working there, I am no less excited and challenged by anticipation of the upcoming field season. I firmly believe that it is important for my own children, and for all the children of an otherwise grossly overcrowded earth, to know that there is a place like Antarctica where sustenance cannot be found on that continent, let alone at the end of the street in the convenience store.

In order to get agreement among claimant and non-claimant nations 30 years ago, US Ambassador Paul Daniels and his colleagues sidestepped the issue of mineral resources in drafting the Antarctic Treaty. The oil crises of the 70's reminded us all of the finite nature of mineral resources as a whole, and the diplomatic world geared up to address the issue of deposits in the deep oceans

and in Antarctica, the only parts of the earth's surface beyond the jurisdiction of individual states. Now we face a situation where global environmental problems, heightened by individual and highly publicized incidents such as the grounding of *Exxon Valdez* in Alaska and of *Bahia Paraiso* off the Antarctic Peninsula, have overtaken the slow progress of diplomacy. The diplomatic world has stressed the importance of getting agreement on the regulation of mineral resource activities in Antarctica before any economic deposit is found. The environmental organizations have taken the attitude that the very existence of a minerals agreement will encourage prospecting and eventual exploitation with inherent potential for environmental damage. Some of them have espoused the idea of a "world park", seeing in this concept an umberella beneath which both the wilderness character and environment of Antarctica can be protected. Both attitudes are probably correct. Science, particularly earth science, has been caught in the middle of all this. While most scientists are basically conservationists rather than developers, we have made increasingly large logistic demands in order to pursue our understanding of Antarctica. I find it rather ironic, however, to note that the "Greenpeace Book of Antarctica" draws heavily on the results of that science, while not only decrying, but also blowing out of proportion, the impact that the human race has made on the pristine environment in order to obtain those very important results. Although the environmental organizations take credit for raising the consciences of certain governments operating programs in the Antarctic, they may be unaware that many scientists have quietly, and not without effect, addressed the same issues within their own organizations. No one person or group of persons, no matter how well-meaning, deserves to take all the credit for raising the flag of conservation in Antarctica and the Southern Ocean over the past decade.

Geologic and geophysical reconnaissances have come in for particular attention because they may constitute the basis for prospecting. In the US we have prioritized our Antarctic earth science mainly on the basis of the quality of the science through the peer review process. This has not been true in all nations. Several, despite Article 3 of the Antarctic Treaty, make no bones about the fact that their programs are purely resource-driven. Nonetheless while we in the US have learned much about the environmental history of our planet through basic earth science research in the Antarctic region over the past 30 years, we have also learned where to go explore for exploitable resources. We must learn to live with the fact that fundamental earth science will yield information of all types about the earth. If we want to learn about how the earth works and about how we can conserve it as a habitable planet, we must also learn to deal with the possibility that we may find a good place to explore for oil or metallic minerals in the process. The questions of whether or not we then indulge in prospecting, exploration, and exploitation and with what safeguards, should be a different issue. This is exactly the case off our own shores where the Administration recently came to a decision concerning off-shore leasing for the rest of the century. This decision would not have needed to be made if reconnaissance studies had not led to prospecting. On the other hand these same studies contributed in large measure to our understanding of the San Andreas fault system, of beach erosion, and of oceanic processes that need to be taken into account in waste disposal.

Let me give you specific examples of two earth science projects that are considered to be very important by the national and international Antarctic earth science community, yet both undoubtedly have the potential to increase

our appreciation of where to go, and where not to go, if we decide to look for metallic minerals or hydrocarbons. Groups of Specialists of the Scientific Committee on Antarctic Research (SCAR) of the International Coouncil of Scientifiic Unions have been set up to encourage these projects. Their scientific importance stems from their significance with regard to the Antarctic continent and lithospheric plate as an integral part of the global dynamic and environmental systems. It should be borne in mind here, that geology was the original global science. Geologists have been thinking on that scale since Charles Darwin sailed around the world for five years in the first half of the last century.

The SCAR Group of Specialists on the Structure and Evolution of the Antarctic Lithosphere that I convene is proposing to undertake a modern geoscience traverse of the entire Antarctic continent along the meridian 120°W to 60°E (see Figure 1). This will cross several features of major interest:

1. The Byrd Subglacial Basin - a likely path for oceanic circulation through the center of the continent before the opening of oceanic pathways south of South America and Australia and the resulting inception of the circum-polar current that preceded the ice age.
2. The Transantarctic Mountains - one of the world's greatest mountain ranges that was uplifted during the past 50 million years as the earth's climate deteriorated and glaciated conditions developed.
3. The Pensacola-Pole-Wilkes Land Basin- a continental-scale depression that was inundated by the sea before, and at times during, glaciation.
4. The Gamburtev Subglacial Mountains - a range with nearly 4000 meters of relief that is entirely ice covered and may have been an important center of ice development.
and 5. The Lambert-Amery Rift - a deep, ice-filled depression containing the best record to date of the glacial history of the continent; it is similar to the mid-continent rift system of North America and the Amazon Basin.

The international earth science community proposes to study these features using seismic reflection and refraction techniques developed and perfected in the oil industry. These have been used in the Antarctic on a smaller scale for many years, but we propose to deploy them on a larger scale to study the deep interior of the continent as has been done in the US (COCORP Project), Canada (LITHOPROBE), and Europe (BIRPS). While some of the data obtained at shallow levels by these projects have been of interest to industry, themain benefit has been a new type of data bearing on the deep structure and history of the continents. Likewise the data that we hope to obtain from the Antarctic continent will doubtless be of interest to "frontiers" groups of major oil companies, particularly data from sedimentary basins. The main gain, however, will be in knowledge of the deep structure of the continent and understanding of how it evolved. That in turn will lead us to better understand the role of the lithosphere in the deterioration of global climate that led to the ice age. I am talking here about much longer time scales, tens to hundreds of millions of years, than those generally associated with the term "global change." I submit, however, that it is vital to consider the short term anthropogenic changes in the perspective of the longer term natural changes. It is in this area that geology and geophysics play their most fundamental role.
The efforts of the SCAR Group of Specialists on the Cenozoic Palaeoenvironment of High Southern Latitudes, convened by Dr Peter Noel Webb of Ohio State

University is complementary. The environmental changes they study are to some degree controlled by the lithosphere, as I have indicated, but the stratigraphic framework that they are developing is critical in the interpretation of the geophysical data. Given the paucity of young sedimentary strata on the continent (most of it has been stripped off by the ice), they are largely dependent on holes drilled through the ice shelves and offshore for their data. Offshore drilling is in turn dependent on marine geophysical data for a site survey prior to drilling, a requirement for both safety and pollution prevention. The same techniques are, of course, used in the search for oil, and despite efforts to avoid hydrocarbons, there have been some traces of hydrocarbons in cores obtained by the Ocean Drilling Program and its predecessor, the Deep Sea Drilling Project. There has been a lot of misinformed comment about the nature of these traces. In mentioning that hydrocarbons were seen in the course of a far South Atlantic cruise on which I was Co-Chief Scientist, for example, journalists invariably fail to mention that similar strata of the same age throughout the region, including the Antarctic Peninsula, are well known as a source rock for oil and gas that are exploited in southern South America. Absence of reservoir rocks limits the potential of the region, and a recent study indicates that this is likely to be the case in the offshore Antarctic Peninsula. The lesson of all this is that marine geophysics and drilling are necessary for acquiring data about climate change around the Antarctic, a critical area for studies of global change. To date there have been five cruises of the Drilling Vessels *Glomar Challenger* and *Joides Resolution* in Antarctic waters. They have made an unrivalled contribution to the history of climate change and the record of glaciation, and such studies need to be continued to further our understanding of the records, and of the processes involved.

What then are my concerns as an Antarctic earth scientist contemplating the consideration of CRAMRA and legislation that might arise from ratification or rejection in the United States? They are twofold:

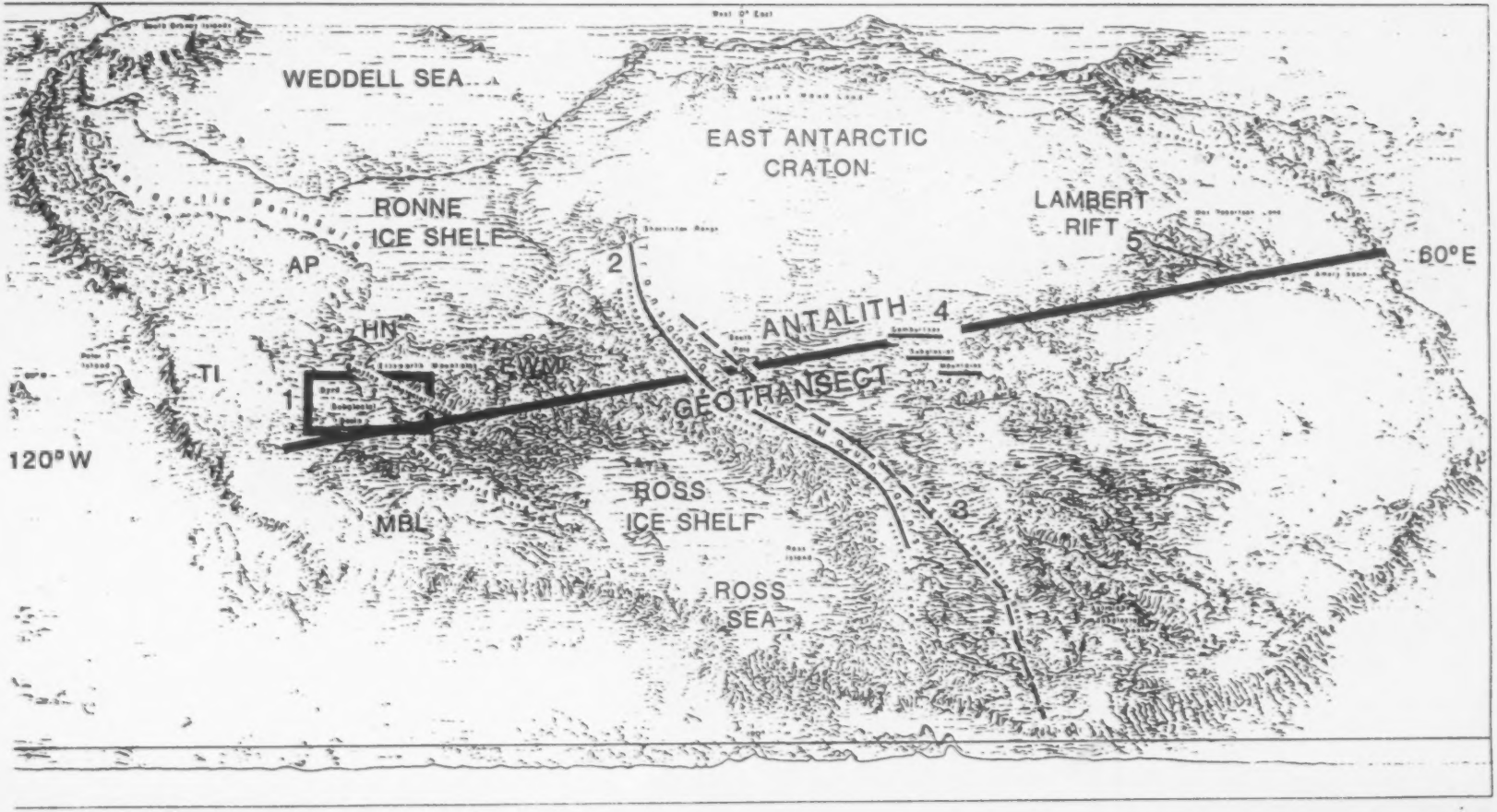
> First, I am concerned that outright rejection of CRAMRA is likely to take place in a legislative climate that might lead to restrictions on the type of scientific endeavor that I have outlined above, endeavor I believe to be essential if we are to understand the way the earth works, and as I said at the beginning of this testimony, the way in which people can maintain a habitable planet. Such restrictions would only come into being with a well-meaning, but in my view totally ill-informed and potentially damaging, mind set. One that views earth science research in a negative light because it uses scientific techniques in the Antarctic that are also used to find hydrocarbons elsewhere, and might lead to the discovery of mineral deposits that are economically viable.

> My second concern centers on the practical aspect of logistic support for science in the Antarctic. In this I can undoubtedly be accused of conflict of interest as someone who has received considerable support from the Division of Polar Programs of the National Science Foundation for his research in the Antarctic region over the past 20 years. I express the concern, however, for the same reasons cited above; namely that the basic science required for understanding of the Antarctic region in a global context could be precluded by a decision to ratify CRAMRA and to enact enabling legislation that would require extensive use of the limited existing US logistic assets to conduct base-line resource and environmental studies. I am sure that the Committee will

hear from Dr Peter Wilkness and his staff at the Division of Polar Programs of the National Science Foundation that US logistics, particularly a late middle-aged ski-equipped air unit with its unique continental-scale capability, are stretched very thin at present in support of a broad and ambitious science program. I can only emphasize this from the point of view of a grantee, and try to convey to you in the most forcible terms possible, that in my opinion it is naive to think that any base-line resource and environmental studies deemed necessary as part of the potential ratification of CRAMRA can be supported without serious damage to the ongoing basic science program unless major additional funding is made available for logistic support as well as science.

In conclusion, I would like to reiterate that Antarctica is an integral and important component of earth's dynamic systems. It is a continent that must be studied if we are to understand our planet and how it works. I have emphasized the solid earth sciences, but oceanographers, biologists, and atmospheric physicists and chemists can make the same case. Since the Antarctic Treaty was ratified, science has been the vehicle for a political presence in the Antarctic. In the evolving era combining environmental awareness and reduction of international tensions, I contend that scientific research is the *raison d'etre* for national Antarctic programs. I urge that protection of the environment in concert with the nurturing of free and open international scientific enquiry be the cornerstone of US decision-making with regard to CRAMRA.

1. ANTALITH Geotransect and Byrd Subglacial Basin on physiographic diagram of the Antarctic continent with the ice removed (Tau Rho Alpha and Arthur B. Ford, Oblique Maps of Antarctica, U.S.Geological Survey, 1990).
Crustal blocks (terranes) of West Antarctic mosaic:
AP - Antarctic Peninsula
EWM - Ellsworth-Whitmore mountains
HN - Haag Nunataks
MBL - Marie Byrd Land
TI - Thurston Island



Mr. TORRICELLI. Thank you very much.
Dr. Bentley.

STATEMENT OF DR. CHARLES R. BENTLEY, A.P. CRARY PROFESSOR OF GEOPHYSICS, UNIVERSITY OF WISCONSIN

Dr. BENTLEY. Thank you, Mr. Chairman. I appreciate this opportunity to testify on behalf of Antarctic research.

Protection of free access to all of the Antarctic region for unrestricted scientific research is in my view the most important aspect of deliberations relating to the future of Antarctic. In support of that view, I wish first to make some comments on the importance of Antarctic research. The first, and to me, the most important, aspect relates to the role of Antarctica in global change. I quote from a report by that name published by the Scientific Committee on Antarctic Research last year.

"The Antarctic, including the continent, and Southern Ocean with the sub-Antarctic islands, is a critical area in the global change studies to be fostered by the International Geosphere-Biosphere Programme." Jim Barnes has referred to this already. "Major interactions between the atmosphere, ice, ocean and biota affect the entire global system through feedbacks, bio-geochemical cycles, deep ocean circulation, atmospheric transport, and changes in ice mass balances. The effects of global climate change in Antarctica can be larger and more pronounced that at mid-latitudes, and therefore, better seen and monitored. Antarctica is also a rich repository of palaeoenvironmental information in its ice sheets and its ocean and lake sediments."

Several tasks must be included in an Antarctic component of the IGBP. Implementation of these tasks will require a combination of satellite remote sensing and field programs widely spread over the ice sheet and the ocean. I am concerned in particular with the wording in H.R. 4514, and Congressman Vento's remarks in the Congressional Record, that "this plan would identify areas appropriate for public education . . . , for tourism, and for scientific research."

Access to continental and oceanic regions for scientific research must not be geographically restricted in any large scale sense if these global-change research programs are to be successful. "Areas appropriate for scientific research" must include all of Antarctica, except, of course, Specially Protected Areas, to which access must continue to be limited, as it has been for the last quarter century.

There are many other important aspects of Antarctic research, I will mention just two, for specific reasons. One is the study of the upper atmosphere. The long-term practical goals of high-latitude studies of the upper atmosphere are first to understand how matter and energy from the sun enter the terrestrial outer environment and are deposited in the atmosphere, and then to learn how the associated perturbations relate to and affect lower latitudes and the planetary surface. This understanding, in turn, can be expected to lead to more reliable prediction and possibly alleviation of the effects of space disturbances on some human technologies, such as communication systems and power transmission, and perhaps prediction of certain variations in climate.

Studies of the upper atmosphere need to be made from a few permanent or semi-permanent stations on the ice sheet, including, but not limited to, the station at the geographic South Pole itself. The argument has been made—at least I have heard this argument, although not here today—that such stations are sources of environmental pollution. Witness this long-term slow oil leakage at the South Pole station. But discharges onto or into the ice sheet soon disappear from sight, as they are covered by new snow, and thereafter they have no contact with any form of life on Earth for tens of thousands of years, as they slowly move with the ice downward and outward to the coast. Furthermore, by the time they are discharged into the ocean, they will be broadly disseminated through the ice. I submit, therefore, that they do not constitute any significant form of environmental pollution.

The other type of research I want to mention is Antarctic earth science. The principal objectives of geological and solid-earth geophysical research in Antarctica are to determine the role of the south polar regions in global geodynamics, to understand the evolutionary history of the endemic biota of the continent and surrounding seas, to understand the role of the continent and its ice cover in the inception of the present ice age and its fluctuations, and to understand the role of Antarctica in the evolution of the present ocean circulation.

These objectives can be met partly by examination of exposed rock. But 98% of the area of interest, out to the edge of the continental shelf, is covered either by water or by ice. The only way to study these regions is by geophysical exploration, that is short of actual drilling, which I should mention. That means seismic work, including use of explosive on the ice sheet, as well as various forms of aircraft-borne and satellite-borne remote sensing.

This is not exploration for mineral resources, but exploration for clues to vital aspects of the structure and evolution of the Earth and its climate. Understanding the past is an essential part of understanding how the Earth system works so as to be able to predict the future. I urge that use of the powerful tools of geophysical exploration not be denied to Antarctic earth scientists just because the data obtained might also be useful if there were to be a search for mineral deposits.

My concern here relates to the proposed ban, in H.R. 3977, on geophysical remote sensing, and other "prospecting" activities, "the purpose of which is the identification of mineral resources potential." Who would interpret the purpose of a particular geophysical survey? The possibilities for stymieing legitimate research activities are evident and threatening. Ban certain uses of the knowledge, yes, but do not ban its collection.

So far I have addressed myself to concerns relating to non-interference with research activities in the development of comprehensive protective measures for Antarctica. Different concerns are connected with the possible implementation of CRAMRA. If legislation supporting CRAMRA is written, I urge that there be provision to protect scientific research funds against possible drain for mineral resource evaluation. Let the potential commercial beneficiaries of mineral development conduct the exploration activities. The

United States Government should not be responsible for carrying out surveys at public expense.

I am also concerned that Antarctic science continue to be conducted as basic, not applied, research. The U.S. Antarctic Research Program run by the National Science Foundation has been a huge success over the last 35 years. It would be a calamity if the investigator-proposed research supported by NSF were replaced in any substantial part by a mission-driven, directed research program of some other agency. I support continued NSF direction of the U.S. Antarctic Program, whatever kind of measures for Antarctica may eventuate.

In summary, I believe Antarctica should be set aside as a scientific and ecological preserve. There is great societal import to Antarctic research. The continent and surrounding oceans therefore should be entirely open to research activities, except in specially set-aside Specially Protected Areas. Mineral development may, and I believe should, be banned. But geophysical exploration of Earth structure and Earth history, with full international exchange of data, must be allowed to continue.

Thank you, Mr. Chairman.

[The prepared statement of Dr. Bentley follows:]

TESTIMONY OF CHARLES R. BENTLEY
A. P. CRARY PROFESSOR OF GEOPHYSICS
UNIVERSITY OF WISCONSIN, MADISON
BEFORE THE
SUBCOMMITTEE ON TRANSPORTATION, AVIATION AND MATERIALS
SUBCOMMITTEE ON SCIENCE, RESEARCH AND TECHNOLOGY
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
JULY 12, 1990

Mr. Chairman:

I appreciate the opportunity to testify before these subcommittees on behalf of Antarctic research. Protection of free access to all of the Antarctic region for unrestricted scientific research is, in my view, the most important aspect of deliberations relating to the future of Antarctica. In support of that view I wish first to make some comments on the importance of Antarctic research.

The first and, to me, most important aspect relates to the Role of Antarctica in Global Change. I quote from a report by that name published by the Scientific Committee on Antarctic Research last year.

"The Antarctic, including the continent and Southern Ocean with the sub-Antarctic islands, is a critical area in the global change studies to be fostered by the International Geosphere-Biosphere Programme. Major interactions between the atmosphere, ice, ocean, and biota affect the entire global system through feedbacks, bio-geochemical cycles, deep ocean circulation, atmospheric transport, and changes in ice mass balances. The effects of global climate change in Antarctica can be larger and more pronounced than at mid-latitudes and, therefore, better seen and monitored. Antarctica is also a rich repository of palaeoenvironmental information in its ice sheets and its ocean and lake sediments.

"Four major, interconnected, interdisciplinary research thrusts define and encompass the research priorities of an Antarctic component of the IGBP:

- detection of global change in Antarctica
- study of critical processes linking Antarctica to the global system
- extraction of palaeoenvironmental information
- assessment of ecological effects.

Under each of these four major headings, several research tasks are identified.

"Causes of global change include changes in atmospheric composition, primarily the greenhouse gases and stratospheric ozone (which is already decreasing strongly in Antarctica). The most effective indicators of

climatic change which can be readily monitored in Antarctica include sea-ice extent and thickness, changes in ice sheet mass and velocity, sea level, temperatures, radiation fluxes and biota on the continent, in the surrounding seas and on sub-Antarctic islands.

"Processes linking Antarctica to the global system include the functioning of the high latitude regions as heat sinks that help to drive the global circulation. The sea-ice feedback processes amplify the climate signal at high latitudes. Physical, chemical and biological processes affect ocean bottom water formation, the CO_2 sources and sinks, and the global thermohaline ocean circulation. Mass balance changes of the Antarctic ice sheets affect global sea level; in particular, the possibility of rapid shrinkage of the West Antarctic ice sheet needs to be investigated. Study of these processes must include attempts to model them interactively in coupled numerical models.

"To understand future changes, Antarctica can provide highly relevant palaeoenvironmental data from ice cores and from sediment cores from the ocean and lakes; the striking results obtained from the Vostok deep ice core illustrate this. Collection and comparison of such data sets with other global palaeoenvironmental data is a high-priority research objective.

"Finally, assessment of ecological effects includes the modelling of predicted environmental changes of biological significance and their adequate monitoring. Changes in sea-ice extent will affect overall primary production, carbon fixation and, hence, the global CO_2 budget of organisms. Moderate warming in Antarctica can result in greater plant productivity and relatively rapid colonization of newly de-glaciated areas.

Several tasks must be included in an Antarctic component of the IGBP. They are

- To provide an Antarctic input to ongoing and developing international programmes studying global change;
- To monitor the rate and extent of change in the Antarctic sea ice, atmosphere, ocean and biota, and study their interactions;
- To establish a system to measure changes in Antarctic snow accumulation and ice flow likely to affect ice mass balance and sea level;
- To study the processes influencing the distribution of ozone in the Antarctic stratosphere and the consequential changes in ultraviolet radiation and its impact on the biosphere;
- To clarify further the past global environmental changes using deep ice cores and sediment records from Antarctica."

Implementation of these tasks will require a combination of satellite remote sensing and field programs widely spread over the ice sheet and the oceans. Here I am concerned with wording in H.R. 4514, and Congressman Vento's remarks in the

Congressional Record, that "this plan would identify areas appropriate for public education..., for tourism, and for scientific research [emphasis added]." Access to continental and oceanic regions for scientific research must not be geographically restricted in any large-scale sense if these global-change research programs are to be successful. "Areas appropriate for scientific research" must include all of Antarctica except, of course, Specially Protected Areas, to which access must continue to be limited, as it has been for the last quarter century.

There are many other important aspects of Antarctic research; I will mention just two, for specific reasons.

One is the study of the upper atmosphere. The upper atmosphere at high latitudes has rightly been called "earth's window to outer space." Many geophysical effects displayed there are direct manifestations of phenomena occurring in deep space that thus become available to "remote sensing" through this window in the polar regions. Even the deep-space medium itself -- solar-wind plasma -- enters in the form of a narrow beam through this window to interact with the upper atmosphere at high latitude in the so-called "cusp" regions. The polar regions of the earth are thus important areas for the study of space and its effects on our environment. Furthermore, there are many features of mid-latitude upper-atmosphere behavior whose origin can be traced to high-latitude processes.

The long-term practical goals of high-latitude studies are first to understand how matter and energy from the sun enter the terrestrial outer environment and are deposited in the atmosphere, and then to learn how the associated perturbations propagate to and affect lower latitudes and the planetary surface. This understanding, in turn, can be expected to lead to more reliable prediction and possible alleviation of the effects of space disturbances on some human technologies, such as communications systems and power transmission, and, perhaps, prediction of certain variations in climate.

Many of the effects associated with disturbances in space can be studies in either or both of the two polar regions. Most of these studies can be conducted more cost-effectively in the northern polar regions, but some require simultaneous measurements in the south. In addition, Antarctica offers unique observational opportunities, some related to the geographic asymmetry of the internal magnetic field of the earth and some to local conditions, such as the low electromagnetic noise background, the generally good atmospheric viewing conditions, the six-months-long summer day at the South Pole, the extensive, thick ice sheet of nearly uniform dielectric properties, and the absence of national boundaries.

Studies of the upper atmosphere need to be made from a few permanent or semi-permanent stations on the ice sheet including, but not limited to, the station at the geographic South Pole itself. The argument has been made that such stations are sources of environmental pollution -- witness the slow, long-term oil leakage at South

Pole Station. But discharges onto or into the ice sheet soon disappear from sight as they are covered by new snow, and thereafter they have no contact with any form of life on Earth for tens of thousands of years, as they slowly move with the ice downward and outward to the coast. Furthermore, by the time they are discharged into the ocean they will be broadly disseminated through the ice. I submit, therefore, that they do not constitute any significant form of environmental pollution.

The other type of research I wish to mention is Antarctic earth science.

The Antarctic continent is unique in its relationship to the geographic and geomagnetic poles and in its ice cover. Whereas the Arctic is an ocean largely covered by ice and surrounded by land, the south polar regions consist of an isolated continent surrounded by ocean; the evolution of the Southern Hemisphere, leading to the present physical isolation of Antarctica, relates directly to the development of the present oceanographic circulation and marked climatic contrasts of the earth. Furthermore, the Antarctic continent and surrounding ocean basin, which together constitute the Antarctic plate, are an integral part of the geodynamic setting of the earth and contain information essential and possibly even key to understanding its evolution. How the present climate of the earth, with strong latitudinal temperature gradients, evolved from the much more equable climate of 50 million years ago is a question for which Antarctica may hold some of the answers. The development of the Antarctic ice sheet and the associated climatic cooling is the most significant environmental event in the last 50 million years. It has had a profound effect on world climate and thus on the history and development of marine and terrestrial biota. The factors that led to the inception of the ice cover are far from clear, though the isolation and polar position of Antarctica, attained as a result of breakup of Gondwanaland and subsequent plate movements, must have played a role. One consequence has been the development of circumpolar circulation of water masses and unrestricted circulation of the atmosphere, the two combining to give a physical isolation that is reflected in the present climatic extremes of the continent and one of the most pronounced oceanic boundaries on the earth, the Antarctic Convergence.

The principal objectives of geological and solid-earth-geophysical research in Antarctica are to determine the role of the south polar regions in global geodynamics, to understand the evolutionary history of the endemic biota of the continent and surrounding seas, to understand the role of the continent and its ice cover in the inception of the present ice age and its fluctuations, and to understand the role of Antarctica in the evolution of the present ocean circulation.

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aircraft-borne and satellite-borne remote sensing. This is not exploration for mineral resources, but exploration for clues to vital aspects of the structure and evolution of the Earth and its climate. Understanding the past is an essential part of understanding how the Earth system works so as to be able to predict the future. I urge that use of the powerful tools of geophysical exploration not be denied to Antarctic earth scientists just because the data obtained might also be useful if there were to be a search for mineral deposits.

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Summary

In summary, I believe Antarctica should be set aside as a scientific and ecological preserve. There is great societal import to Antarctic research. The continent and surrounding oceans therefore should be entirely open to research activities, except in specifically set-aside Specially Protected Areas. Mineral development may, and I believe should, be banned, but geophysical exploration of Earth structure and Earth history, with full international exchange of data, must be allowed to continue.

Mr. VALENTINE. Thank you. I have the great advantage of being able to ask questions and missed your testimony.

Ms. Marks, you obviously are opposed to CRAMRA, and support a total ban on mineral exploration and development. What, in your opinion, will the situation be if neither agreement is reached or ratified? Would we not have the same or a greater problem?

Ms. MARKS. Neither meaning the comprehensive convention?

Mr. VALENTINE. Yes.

Ms. MARKS. I think that in the interim, if a moratorium can be worked out, that there would not be a problem. I don't believe that any one country would be willing to mine in the face of not having secured rights, perhaps. I don't think any one nation would want to start mining in the face of defying the Antarctic treaty system. It has pretty much worked.[6]

I don't think there would be an issue of a free-for-all in mining. I think that if in Chile we start to lay the groundwork for a comprehensive system of protection, and along with that some agreed system of banning prospecting, at least for the moment, would also come into play, to enable the time needed to fully explore a protection regime. As my colleague Jim Barnes said, we believe that CRAMRA, instead of being thrown out, should maybe be put on a very high shelf for the next 50 to 99 years.

Mr. VALENTINE. How many years?

Ms. MARKS. Fifty to 99 years. The hope is that in 99 years the need for CRAMRA will be a moot point, at the very least, but we are willing to put it on a high shelf and perhaps take some of its good environmental provisions out to facilitate the protection convention.

Mr. VALENTINE. Do you have any information that you would like to share with the subcommittee with respect to what you and your organization might perceive to be some dangerous propensities on the part of some nations who presently have a presence in Antarctica? Is there suspicion as to what the plans of this national group or that national group might be, based on what they have done in the past?

Ms. MARKS. Mr. Barnes is more involved with the international scene.

Mr. BARNES. Mr. Valentine, are you thinking about the interest of some nations in exploring for minerals?

Mr. VALENTINE. Yes. Do you have information, suspicions that are based on either a real or perceived attitude as to what this country or that country might already have done? In other words, has any country been engaged in any type of drilling or other experimentation that you think is for non-scientific purposes?

Mr. BARNES. I think we really have to go back a few years and look at the situation when the minerals negotiations began. First of all, the governments, as far back as the late 1970s, agreed to what is called a policy of voluntary restraint. Some people called this a moratorium. It actually is not a moratorium. It's a kind of voluntary gentlemen's agreement.

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[6] Witness requested that the following statement be added: "The treaty nations believe that the Antarctic treaty system has successfully managed their actions on the continent and are loathe to conduct activities which are prohibited by the treaty."

But it has, I believe, had the effect of deterring any government from carrying out any serious activity, certainly any drilling, of the sort that you are talking about.

On the other hand, because there was a negotiation actually going on from 1982 through 1988 to have a minerals convention, it certainly induced a certain higher order of interests, shall we say, on the part of certain governments to invest more in geophysical scientific work of various types. In other words, the Soviets did a lot of aeromagnetic work with airplanes. A number of other governments did quite a lot of seismic work, as you heard earlier this morning. It was not, I think, truly commercial. It was not the close spacing of the tracts. It was not of the sophistication that you would see in a truly commercial setting.

But the data was not always turned over as we would like to see it in the treaty system, and it led to some concern, both amongst governments and amongst environmental groups that people were playing games with some of this data.

I personally believe today that there is not any of that activity going on at the present time, and I have encouraged our Government to take some steps, which it has done to some extent, to call for all data of a geophysical sort to be put into international data archives which preserve the principle of the Antarctic treaty for full exchange of all scientific data. I don't have any suspicions or fears at the moment of the sort you are talking about.

Mr. VALENTINE. Mr. Dalziel.

Dr. DALZIEL. I just have one comment. I think the only activities that have been going on are in the seismic field. As Mr. Barnes has put it, they have been rather broadly spaced surveys. I certainly know that, for example, in interacting with Brazilian colleagues and asking for access to data for an international project, we were just told that Petrobras, who conducted the survey, is an oil company, and this is oil company data. When you say, "What about Article 3 of the Antarctic treaty?", we are told we will have to pursue that through their government.

The difficulty with some of the data bank notions is that it is very hard to sometimes get one's own colleagues to give you access to their data, whether or not it is in the Antarctic, because they just haven't had time to get around to really working that up.

So care again has to be taken with trying to really understand the purpose of geophysical work in particular. In January and February we will conduct with the research vessel Morris Ewing what will be the most powerful marine seismic survey undertaken yet in the Antarctic, with the most powerful airgun sources. But that work will be all completely open and it will be published as soon as we can get it out.

Mr. VALENTINE. Could you explain in laymen's terms what a modern geoscience traverse consists of and what you as a scientist are likely to learn from such an activity?

Dr. DALZIEL. There are two aspects to the Antarctic. One, as I indicated earlier on, is that it is an integral part of the global system, and you need to understand it in order to understand the whole globe. There is another aspect that is that there are certain natural laboratories there that are world class examples of, for instance, continental margin mountain range, the Antarctic Peninsula. It is

a much simpler system than the Western Cordillera of North America. So if you want to understand the way in which a mountain range like the North American Cordillera formed, you can go and see an early version of that along the Antarctic peninsula margin.

Therefore, since seismic work is a lot cheaper at sea than it is on land, you can hope to understand the deep structure and the way in which the mountain range evolved down there more readily and far more cheaply than you can in the case of North America or the Andes.

The other example where you are looking at the Antarctic as part of the global system, transecting the middle of the continent would involve the use of a lot of explosives for seismic reflection and refraction, the kind that Charles Bentley has been undertaking for a long time, but with more explosives and a lot more recorders, so that you can conduct a sophisticated computer analysis of the returning signals, and get a picture of the earth underneath up to 4,000 meters of ice down to the bottom of the Earth's crust.

Mr. VALENTINE. Would such an activity be likely to lead to the discovery of oil in Antarctica?

Dr. DALZIEL. In the broadest possible way, you could certainly say. In particularly the Byrd Basin, across which we first planned to traverse, is a basin. I would fully expect to find sediments there that might be hydrocarbon bearing when you look at the evidence at the edge of the continent, in the Ross and Weddell Seas, and extrapolate that in toward the interior.

So you will get a picture of a sedimentary basin. But one seismic line 600 kilometers long is a long way from the type of sophisticated three-dimensional seismic survey which oil companies now conduct in places like the Gulf of Mexico.

Mr. VALENTINE. Ms. Marks, you oppose seismic blasting in Antarctica. What about seismic blasting in connection with scientific experimentation?

Ms. MARKS. I think the general consensus is not so much opposing or not opposing blasting. I think the feeling—and this is one that has been reflected in the recent recommendation and adopted at the last treaty meeting—is that environmental assessment or impact statements should be undertaken prior to any activity that might potentially affect the environment to ascertain if indeed it will have a negative effect on the other uses of the Antarctic. To proceed or not proceed—a determination would be made after the statement is prepared.

I think that is consistent with U.S. policy. I don't think it is inconsistent or should not be inconsistent with our policies in the Antarctic. We should be able to, at a minimum, maintain the same standards. If indeed this type of blasting would negatively impact all the other uses of the Antarctic, we might have to seriously question if indeed the knowledge gained, the value of that knowledge, is greater than what would be lost.

Mr. VALENTINE. Some reference was made previously to the condition of the face of the land in Antarctica, perhaps around McMurdo, the oil drums and the environmental problems there, waste dumpage, and that sort of thing. You were here, I suppose, and heard some of those discussions.

Do you have any reason to believe that satisfactory progress has been made to clean up that situation, which I suppose, I must say parenthetically, maybe one of the witnesses referred to the fact that we have had a presence there for 30 some years, and that our concern for the environment back 30 years ago was not as it is today. That indicates to me that maybe scientists are nothing special when it comes to abuse of the environment, unless they are subject to the constraints of the Environmental Protection Agency, I suppose.

But what do you say about all that?

Ms. MARKS. From discussions I have had, I do believe an attempt has been made to start retrograding some of the wastes. I am not sure if indeed all of the wastes will ever be retrograded or if the intent is to retrograde it all, bring it all back, or if the assumption is that some of the waste would be better off left alone.

In comments that I have heard at one time, and this might have changed since then, was that we would rather not move some of the waste because it will create a greater hazard. I don't know if I personally agree with that. I have conducted research in the Antarctic, so I have been there, I have seen it. The spectacular beauty of it should not be mitigated by having a dump, or a scar, in the middle of the ice. I truly believe that everything should be retrograded. Not having been there in 10 years, I can't say that it has or has not been.

But my feeling is that that should be mandated. Everything we bring there should be returned. To help with this, we should make sure that whatever we bring to the Antarctic, we minimize the non-recyclables that go into the Antarctic. That would help us in retrograding all wastes.

Mr. VALENTINE. Would anyone else like to comment on that? Mr. Bentley.

Dr. BENTLEY. Yes, I would. I have been going through McMurdo every few years for the last 30 years. There has been a tremendous change. Not only has the station grown a lot in those years, but particularly in recent years, the cleanup has proceeded at a commendable pace, I think. It is not done yet. But to look at McMurdo in the last year or two and compare it with what it looked like 10 years ago, one can see a very impressive change.

Part of the debris that was dumped back in the late 1950s and early 1960s is buried to the point where, as Ms. Marks commented, it may be more damaging to the environment to dig it out and remove it than it is to leave it buried where it is. But beyond that, the effort is being made and the cleanup has proceeded to an important extent. I have every confidence that it will continue to do so.

I agree with your remarks that scientists are not any better than anyone else when it comes to protecting the environment. We are also like everyone else these days in our concern with protecting the environment. We do search for ways to do our work, and to encourage the stations to do their work in a way that is as protective as possible.

Mr. VALENTINE. Mr. Barnes.

Mr. BARNES. We have been on the one hand very supportive of NSF's intentions the last few years to have a special cleanup pro-

gram and have testified on several occasions in favor of the special request for funds to carry out that effort. We hope that the Congress will continue to put those funds up. We think that is very important.

On the other hand, I think we have been distressed to see that some of what you might call the philosophical underpinnings of the present situation have not been addressed. During the last 12 or 15 months, for example, there were a whole series of oil spills in and around U.S. facilities. One of them, of course, the most tragic, was not caused by our people. It was the Bahia Paraiso mixed-use Argentine vessel, which sank off Palmer Station, causing a lot of damage to our research there.

But a lot of other U.S. facilities have been plagued by various kinds of leaks and spills. It opens up a fundamental question of how the energy that is used in the Antarctic is generated. Almost all of it is generated with fossil-fuel fired generators, using diesel generators. We keep asking, and have for a number of years—maybe Congress could help instigate something positive in this respect—why the governments down there don't have in essence a competition to come up with the best soft energy sources, not using fossil fuels to generate their energy?

There is a heck of a lot of sunlight for six months a year, and there is a lot of wind most of the time. There probably are some very clever things we could do with all our wonderful knowledge from our military and space programs, and apply it in the Antarctic in some very creative way. If we could stop using fossil fuels down there, it would also have benefits for atmospheric pollution, which are apparently serious in some of the areas.

So I think there is a long way to go with this whole idea of the cleanup, both in specific terms like Beth was saying, the retrograding of waste in general, and in really looking at how to minimize the impact of the program, starting at square one.

Mr. VALENTINE. I would like to ask each one of you if you would comment on the problem with respect to proliferation of tourism? I asked a witness on the previous panel some questions about that and was reminded of the airplane loaded with sightseers that crashed some time ago there. I did not realize a lawsuit was pending in Federal Court, a class action suit by some of the family of some of those who were killed. I find that a pretty rough situation. When I was in law school years and years ago, there were two principles which seemed to knock out that type of lawsuit. One was called contributory negligence and the other was assumption of risk. I had one professor that said if you get around behind the heels of a contrary mule, that's contributory negligence. If you pull his tail, that's assumption of risk.

That sort of thing is a problem connected with tourism. Beginning with you, Ms. Marks, would you comment on that? When I was there, a memorable occasion two and a half years ago, I heard a lot about that, and I understand it. When people begin to go into that hostile environment, birdwatchers and others, it brings a lot of problems for those who have some official responsibility, beginning with the problems placed on the rescue operations. Then there is the waste and desecration. Would you comment on that?

Ms. MARKS. First I will comment on the plane crash. I was at McMurdo at the time of the crash, and I will tell you that for several weeks, maybe a month after the crash, all we saw was the entire support personnel of the New Zealand base and a good portion of our support people dedicated to retrieving bodies, bringing them back in body bags. That is very unfortunate in the worst case scenario of what tourism can do to any scientific research being conducted on the continent. All of the support personnel for science by right had to cease while the bodies were brought back for removal to their countries.

Mr. VALENTINE. How long ago was that?

Ms. MARKS. It was in the fall of 1979. Tourism is a mixed blessing. On the one hand, I have found when I give talks on the Antarctic, tourists who have been to Antarctica are a firm proponent of saving the Antarctic. They come back fully converted and they want to do what they can.

On the other hand, without proper regulation of tourism, we have had a lot of problems. Tourists have been seen in protected areas, have been allowed to walk in protected areas. There have been overflights by helicopters of penguin rookeries which causes a great deal of stress on the animals. In a hostile environment where every ounce of energy is accounted for, there is no spare change. There is no spare energy.

So we need a lot more regulation. We need international regulation also. I believe that the treaty nations have addressed this and have not come up with any conclusions. But it has been an ongoing mention that we need to address this.

Mr. VALENTINE. Isn't it more likely an environmental threat than the hypothetical minerals development?

Ms. MARKS. I don't think it's more of a threat. I think you are looking at different scales. If you have 500 or 600 people descending on one area in the Antarctic, you will have a huge localized impact, but that is it. It will stop there. If you start with mining, the impact will not be localized. It will not just be the one area where the infrastructure is maintained. It will also cause untold pollutant effects far beyond the limitations of the oil structures. That will have much more of a continent-wide effect.

But that doesn't say that we should neglect regulated tourism for the sake of minerals. We need to stress them both.

Mr. VALENTINE. Anybody else?

Mr. BARNES. Picking up on what Beth said, I think the environmental groups that are part of the ASOC coalition have come to some interim conclusions. They are along the following lines. We should not allow continent-based tourism to be started. There were proposals, for example, in Australia, about 18 months ago, by a major tour operator and a consortium of resort type people to build a major hotel structure with a big air strip and so on to greatly increase the scale, number of flights and all that, to a particular area.

That is on indefinite hold, as I understand it, because the Australians did apply in the EIS procedure, which is pretty stiff. It is not dead, as I understand it, but it is not going anywhere anytime soon.

But at the moment that shows you where we stand. If an individual country wants to try to regulate the activities of a tour opera-

tor under its jurisdiction, it can use national laws, if it cares to do so, to regulate or even stop activity. That's the thrust in part of some of the legislation that the Congress is looking at now.

Another question is how big should ships carrying tourists be? I think you heard Dr. Wilkniss note this morning that one of the new ships on the drawing boards will take 400 or 500 people, instead of 100 people. So we are talking about scale here. If 500 people show up at Palmer Station, it will have a pretty serious effect on the work being done at Palmer Station. Already with 100 people, it stresses the scientists to some extent, and their program is put on a second tier on the day the boat shows up.

Another aspect is who regulates the boats themselves? We don't have a full register yet, but some of our colleagues in other countries have been looking into the vessels themselves that are carrying tourists. We find that several of them are not ice strengthened, according to Lloyd's classifications. They don't have proper safety equipment, and so forth. The Bahia Paraiso, that mixed-use vessel that went down last year with some tourists on board, was woefully lacking in different kinds of safety equipment.

So we really would like to see the treaty parties as a group bite the bullet on tourism. They have been talking about it in resolutions and recommendations for about 15 years. They need to come up with some system that can stop the worst situations from occurring, and regulate all the others we do allow to make certain that good equipment is on those boats.

Mr. VALENTINE. Mr. Dalziel.

Dr. DALZIEL. Mr. Chairman, I did on one occasion give lectures on one of the tour vessels for the Smithsonian when they had a cruise for their travel associates. I was incredibly impressed at how the people on board the ship and running the tour got everybody on board to be extremely conscious of being in the Antarctic. Their conduct was quite exemplary. Obviously, once you start getting up into larger vessels—this one was about 125 tourists—once you get into the 400 and 500 range and you are all trying to land, there are a limited number of places where you can land that many people, probably not including Palmer Station.

But that is going to create severe problems. But there will always be risks, and I must say, with the greatest sympathy in the world for a terrible disaster like the Air New Zealand crash, that flying around in a very fast, big aircraft at about 6,000 feet with a 13,000 foot volcano around is getting behind your mule.

Mr. VALENTINE. Yes, I think so also. Is there any international effort that you know of now, are there discussions or anything in the works that would tend to bring some organized effort to regulate tourism, to lay down certain rules and to govern this phase of what might be a problem?

Mr. BARNES. There are two things one might point to. First of all, some tour operators, some of the ones here in the United States, have actually developed a voluntary code of conduct over the last 12 months, which is very welcome and has a lot of good ideas. I don't think it goes far enough. For instance, it does not deal with the ice-strengthening of the vessels in detail.

But there are some good ideas that are included among that voluntary code which the environmental groups, to some modest

degree, have commended to other tour operators. I think some of those ideas will find their way into the comprehensive measures proposals which will be fleshed out at the meeting in Chile in November and early December this year. But that is the meeting at which we have a chance to start looking in detail at what we want to do to regulate tourism, along with a whole host of other issues, which I would like to mention quickly.

There is not a liability system for this treaty right now, so that when the Bahia Paraiso went down a year ago and caused damage to U.S. interests, for example, cost us cleanup money and hurt the research effort, we can document millions of dollars of expenses, and we don't have a viable mechanism for attaining recovery. That's another loophole in the treaty system right now that needs to be addressed, and I think will be addressed starting at this meeting in Chile.

Dr. BENTLEY. I think there is another approach that will be helpful. The managers of the national Antarctic programs, Dr. Wilkniss and his equivalent, and all the other countries that have research programs in the Antarctic, are very much concerned with the tourism problem. It is a major item on their agenda to consider what can be done. Of course, they are not the ones that are actually running the tours. But the national Antarctic programs have a lot to say and can influence to a considerable degree what is actually done in terms of tourist operations.

I would also like to comment that I think tourists should be allowed to go to the Antarctic. I think it is a very important aspect of the Antarctic, to allow tourism there. Certainly there has to be proper regulation, and I support all the other ideas related to that.

But as you know, there is not substitute for having been to the Antarctic and having seen it in terms of appreciation of the area.

One other comment related to what was said earlier, the ultimate damage that can be done from mineral exploration, I agree, is more than what can be done by unregulated or insufficiently regulated tourism or science, for that matter. But unregulated tourism and science are far more of an immediate problem than the mineral one. I don't see that there is likely to be any exploitation of minerals in the Antarctic for decades, if ever. I hope never. Whereas the problems, particularly with the tourism, are on us right now and need to be handled immediately.

Mr. VALENTINE. Mr. Bentley, among the provisions of the comprehensive regime for the environment is a requirement for establishing "appropriate mechanisms to provide for the compilation review and utilization of relevant data and information" for the purpose of "assessing and where necessary revising and extending environmental standard and procedures."

What is your view with respect to that requirement? And is the scientific community concerned with issues of regulating scientific information and data?

Dr. BENTLEY. The scientific community is primarily concerned with the collection of the data and the free dissemination of the data. I think it is important that greater attention than has been given heretofore be given to monitoring various aspects of the environment. Long-term monitoring programs have never been the strong suit of investigator proposed research. Scientists generally

like to get their results in a hurry and get some papers into publication.

Environmental monitoring has not proceeded in the Antarctic at the level that it ought to. So it ought to be encouraged and proper sites need to be set aside for environmental monitoring, both to see what is going on in the Antarctic itself and to guard against possible damage to the environment, but also as a early warning system in both polar regions, actually, for climatic changes, global changes that will eventually hit the rest of the Earth.

Mr. VALENTINE. Thank you all very much. I don't have any further questions. Do any of you have any further comments, any parting shots?

Mr. BARNES. I wanted to clarify one thing that came up a number of ways through the course of the hearing this morning. It has to do with the position of environmental groups in scientific geophysical work.

I want to make this very clear. We are not against scientific geophysical work. We are not against any scientific work. We are in favor of using Antarctica as a global platform of the highest possible value for different kinds of questions to be answered. We are against minerals companies, whether state-owned companies or private companies, carrying out geophysical seismic work and other activities to try to find oil and gas and minerals.

We recognize that, as people have said, there is a fine line between science on the one hand and the commercial interests on the other. It is easy to say the intention speaks for itself. My operating rule of thumb is that if an oil company is going to do this work, it probably has a commercial interest in its mind. If a scientific establishment, whether a university or whatever it might be, wants to go and look at Earth sciences questions, it probably does not have a commercial interest in mind.

But I think it is very critically important to keep our eyes on the big picture here, which is that we need to use the Antarctic for globally significant science. There may be some scientific programs, I will name one in a minute, that could cause serious environmental risk. Let's talk about drilling into a known basin, for example, to get cores out. That could pose certain risks to the environment.

My personal view is that if it is done as a scientific matter—has nothing to do with an oil company—that it probably should be allowed, but with special controls. Those controls would make it cost more. But if we are really interested in protecting this environment, we would be willing to pay that additional cost, whether it is a blow-out preventer, or whatever it might be.

And as Ms. Marks talked about the EIS procedures, it is also very important that we evaluate carefully in advance of projects of that sort, what the risks may be, so we can mitigate them and make an intelligent decision.

But we are absolutely not standing in opposition to the scientific community in any way here. We want to work very closely with the scientific community to reach a result which we think ultimately will protect their interests, as well as the environmental community's objectives at having Antarctica be left in its pristine state.

Thank you.

Dr. BENTLEY. Back before the first drilling of the Deep Sea Drilling Project in the Ross Sea, in the Antarctic, seismic surveys were run for the purpose of making it as unlikely as possible that the drilling that was carried out would hit oil, an unusual use for a geophysical exploration program. In that case, the purpose was to avoid oil, rather than to find it.

Dr. DALZIEL. Just to add to that, wearing a slightly different hat, I chair the techtonics Panel of the Ocean Drilling Program. There is a pollution prevention and safety panel. It is very hard, indeed, to get a site that you want to drill by that panel if they think there is the slightest chance whatsoever that you will hit hydrocarbons, for safety reasons, as well as pollution. In fact, that basic principle has been extended into Antarctic drilling on land or from the ice, as well as the ocean drilling program in the Ross Sea that Charlie mentioned.

I appreciate hearing Jim Barnes make the comments about science and the environmental scene. I would just like to add that the distinction is even more subtle than he is making it out to be. For example, one of the major programs in studying the earth's crust, carried by the British Institutions' Reflections Profiling Syndicate, or BIRPS, has been using a commercial geophysical ship normally chartered by oil companies because they can get them cheaply. The same might well apply at some point down in the Antarctic when there are vessels in that area conducting surveys off the South American margin.

So it really needs a very, very close attention to what is the purpose and where does the data actually go. That seismic geophysical traverse that I mentioned in the middle of the continent, people who are proponents of this project from the U.S., the U.K., the Soviet Union, New Zealand, and West Germany, have all agreed that the data will be publicly available in geophysical archives within a year of the final season of data collection.

One final comment is that in preparing a proposal for that, which I have just submitted, I had to for the first time fill in the forms which have been added to the requirements for submitting a proposal to the Division of Polar Programs of the National Science Foundation under the program that Dr. Wilkniss mentioned for health, safety and environment. So we do have to immediately address, in putting up a proposal, whether we believe there is any significant environmental risk involved. And if so, can that be mitigated, or does the science need to be balanced against some inevitable damage in the way that Beth Marks indicated.

Ms. MARKS. I would just like to say that the Sierra Club is a member of the Antarctic and Southern Ocean Coalition and the opinions reflected by Jim are exactly what I was going to say, as far as the dichotomy between scientists and the environment. As a scientist and an environmentalist, I am acutely aware of the concerns of the scientific community in the Antarctic, and I also want to say that we in no way, shape or form want to say that Antarctica is off limits to science. But that in order for the Antarctic to be there for science, we need to really regulate our activities.

Mr. VALENTINE. Okay. Thank you all very much. My parting shot is as follows. On my one trip to that magnificent part of the world, I had an editorial write-up in Durham, North Carolina, that

accused me of taking a junket. If I go again, I will try to arrange for him to go with me, so that he can sit in the back of that C–130 for 12 hours or so.

Thank you all very much. The subcommittee is adjourned.

[Whereupon, at 1:04 p.m., the subcommittees were adjourned, to reconvene at the call of their respective Chairs.]

APPENDIX

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EMBASSY OF AUSTRALIA

IN REPLY QUOTE:

2 August, 1990

The Honourable Tim Valentine,
Chairman,
Sub-Committee on Science, Research
and Technology,
House Science, Space and Technology
Committee,
2319 Rayburn House Office Building,
WASHINGTON, D.C. 20515

Dear Congressman Valentine,

I am writing in connection with the joint hearing by the Sub-Committees on Science, Research and Technology, and Transportation, Aviation and Materials, of the House Science, Space and Technology Committee on 12 July, 1990. The hearing addressed United States policy with respect to Antarctica, and protection of the Antarctic environment, including the Convention on the Regulation of Antarctic Mineral Resource Activities.

Australia and France have made written submissions to Congressional hearings earlier this year about their joint initiative for comprehensive environmental protection in Antarctica.

In order to supplement the earlier material and to underline the fact that Australia and France have made detailed concrete proposals on the content of a new legal instrument providing for comprehensive protection, I am enclosing a copy of a recent paper passed to all Antarctic Treaty Parties. It is entitled "Revised Australian - French Paper on the Components of a Comprehensive Regime for the Protection of the Antarctic Environment and its Dependent and Associated Ecosystems".

The paper is not meant to be prescriptive and draws on ideas put forward by other treaty parties. It is, however, the most detailed set of proposals put forward by any of the treaty parties to date and suggests ways a binding regime, which would be effective on the ground in Antarctica, could be put in place. We see merit in this being done by means of a convention linked closely to the Antarctic Treaty in accordance with past treaty system practice. Others are advocating

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consideration of a protocol which would amend the Antarctic Treaty. Ultimately however, it is not the form of the instrument which will be important but its content and workability. In regard to content, protocol supporters have yet to propose concrete ideas which would ensure a truly comprehensive, effective and forward looking approach.

I would be most grateful if you could incorporate the attached paper in the formal record of the joint Sub-Committees' hearing.

I have written in identical terms to the Honourable Robert Torricelli, Chairman of the Sub-Committee on Transportation, Aviation and Materials.

Yours sincerely,

(N. D. Campbell)
Counsellor

Enclosure:

Revised Draft Australian-French Paper on the Components of a Comprehensive Regime for the Protection of the Antarctic Environment and its Dependent and Associated Ecosystems

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At the Fifteenth Antarctic Treaty Consultative Meeting held in Paris in October 1989, the Consultative Parties undertook "as a priority objective the further elaboration, maintenance and effective implementation of a comprehensive system for the protection of the Antarctic environment and its dependent and associated ecosystems aimed at ensuring that human activity does not have adverse impacts on the Antarctic environment or its dependent or associated ecosystems or compromise the scientific, aesthetic or wilderness values of Antarctica" (Recommendation XV-1). To this end, a Special Antarctic Treaty Consultative Meeting will be held in 1990 to explore and discuss all proposals relating to the comprehensive protection of the Antarctic environment.

France and Australia put forward papers at ATCM XV proposing a comprehensive regime. Other Antarctic Treaty Parties also put forward proposals on this general subject. The discussion and wide range of recommendations of ATCM XV bear witness to the importance of environmental questions. There is increasing consciousness of the vulnerability of the Antarctic environment. Perhaps the foremost threats to it arise from human activity outside the Antarctic, concerning which the Antarctic Treaty Parties as a group have only limited influence. They do, however, have clear responsibility for actions that occur within the Antarctic which can threaten the environment. Having regard to this responsibility, Australia and France oppose mining activities in the Antarctic as these are incompatible with the protection of the environment. However, while there is a common link to the environment, the issue of mining is separate from the question of a comprehensive environmental protection regime. In the view of France and Australia, priority has to be given to the question of such a regime, having regard to the growth in human activities generally in the area and the expectations of the international community.

The following paper seeks to set out, in greater detail than appeared in the previous French and Australian draft working paper (XV ATCM/WP/3), possible components for a comprehensive environmental protection regime. In doing this, it draws heavily upon papers of other Parties and discussions at ATCM XV. The paper will seek to identify the general principles that a comprehensive regime should embody, the protective measures that should be taken and the institutional implications of these steps. Initially though, the following general considerations are relevant to the shape of the regime.

I. RATIONALE FOR A COMPREHENSIVE APPROACH

While the evolutionary approach to conservation measures followed to date by the Consultative Parties has been wide-ranging, it has become increasingly apparent that there remain significant gaps. Moreover the implementation of some of the measures has not always been up to the required or desired standards (New Zealand working paper XV ATCM/WP/4, p.1). The existing system requires constant attention to ensure its adequacy in the face of changes in the nature of human activities. These are increasingly diverse and complex and there are many more countries and non-governmental expeditions operating in the Antarctic (Chilean working paper XV ATCM/WP/7, p.1).

It has been recognised that the various elements of the system need to be more integrated and a greater degree of coordination achieved (XV ATCM/WP/4, p.1 and XV ATCM/WP/8, p.3). This is understandable, given the process of incremental elaboration of existing measures over the past 30 years. Chile too has pointed out the need to compile existing measures "in an organic way" and to repair omissions concerning "human activities which are not covered by existing measures" (XV ATCM/WP/7, p.5). The New Zealand paper makes the point that: "Clearly, the existing arrangements taken as a whole are not yet sufficient in scope or implementation to provide the protection that Antarctica warrants, but they do provide a solid foundation on which to build" (XV ATCM/WP/4, pp.3-4).

There is a need to give effect in treaty language to the commitment of the Antarctic Treaty Parties to the protection of the environment. While the record of the Consultative Parties in environmental protection has been quite impressive, it is a measure of how much things have changed that the Antarctic Treaty itself contains no reference to preservation of the environment in its guiding principles set out in the preamble or in the key substantive articles. Indeed, the word "environment" is not used at all in the Treaty. The only environmental reference is to the "preservation and conservation of living resources in Antarctica" in Article IX(1). This silence in the constitutive instrument of the Antarctic Treaty System is inconsistent with the view expressed by Chile that "Antarctica was conceived by the Treaty Parties on the basis of a clear conservation approach" (XV ATCM/WP/7, p.1).

Effects of human activity are no respecter of the artificial competences that may be set up between different institutions. One cannot isolate a particular target (eg. seals) without giving attention to a whole range of matters which may previously have been considered unrelated.

There is also a need to protect the scientific value of a relatively untouched Antarctica. There is a fundamental tension between the value of Antarctica in its relatively untouched state and the increasing human activity. Many of the factors leading to human activity there have their basis in its near pristine condition. Yet it is that very quality that can be most at risk from human activity.

A number of factors make it necessary to undertake a review now of the existing approach that the Treaty Parties have taken to conservation:

- There is increased international attention focused upon the Antarctic in recognition of its importance in the maintenance of the global environment. The Chilean working paper refers to this attention in the context of the depletion of the ozone layer (XV ATCM/WP/7, p.1). It is also important from a global perspective to conserve the ecosystems and physical processes of the region and the genetic diversity of species (paper New Zealand XV ATCM/WP/4, p.3).

- There has been a recent and rapid growth in global environment awareness (XV ATCM/WP/4, p.1).

- As the Chilean working paper has also pointed out, there is a need to respond to concern provoked by recent accidents (XV ATCM/WP/7, p.1).

While noting the immediate scope for additional ad hoc measures to protect the Antarctic environment, in the view of France and Australia it is timely to consider the requirements for overall protection of the Antarctic environment. In the words of the Chilean paper, there is "an ethical, juridical and political imperative for the Consultative Parties of the Antarctic Treaty System to perfect the existing provisions on environmental protection" (XV ATCM/WP/7, p.3). The Antarctic Treaty System has proved itself able to respond effectively in the past to the environmental needs of Antarctica and remains the only forum that can effectively meet changing circumstances. The continuing strength of the Treaty system will depend upon it actually doing so.

II. PRINCIPLES AND OBJECTIVES

Antarctica as a "nature reserve - land of science"

1. Under the comprehensive regime for the protection of the Antarctic environment and its dependent and associated ecosystems, Antarctica should be declared a "nature reserve - land of science".

   Comment: The description "nature reserve land of science" will derive its content from the substantive provisions of the comprehensive regime. The ideas of nature reserve and land of science reflect the two principal and interlinked objectives of the regime, namely protection of the environment and continued dedication of Antarctica to science. Increase in scientific knowledge has been the greatest dividend from human activity within Antarctica.

   The unique qualities of the region which call for it to be created a nature reserve have long been recognised by the Treaty Parties which in 1964, in the Agreed Measures for the Conservation of Antarctic Fauna and Flora, denominated the Treaty Area as "a Special Conservation Area". In the words of the Chilean paper, the policy of 30 years' standing "has resulted in the preservation of Antarctica as an ecological reserve, without affecting scientific research and the other legitimate uses in the region" (XV ATCM/WP/7, p.1 and a similar reference on p.3).

   1.1 The regime should define the "nature reserve" by setting out the following general principles and objectives:

   1.1.1. The regime should provide that the protection of the environment must be a fundamental consideration in the planning and performance of all human activity in the area covered by the Antarctic treaty.

   Comment: Protection of the environment being a fundamental consideration and the need for this standard to apply to all human activities are themes appearing in a number of papers. For example, New Zealand has stated that "the protection of the Antarctic environment is a fundamental consideration in the planning and performance of all human activity in Antarctica" (XV ATCM/WP/4, p.2). Chile too has proposed that

a comprehensive regime should "regulate all of man's activity in Antarctica" (XV ATCM/WP/7, p.1 and also 6). Similarly the Chairman of Working Group I at ATCM XV included these themes as the first of the draft principles for developing comprehensive measures for the protection of the Antarctic environment appended to Recommendation XV-1 (referred to as "Chairman's principles").

The scope of this fundamental guiding principle of the regime is twofold: all activities, whether governmental or non-governmental, will be concerned by the protection of the Antarctic environment and its dependent and associated ecosystems, and it will be incumbent upon each Party to the regime to ensure the application of this principle and to make appropriate efforts to preclude any activity running counter to the regime from being undertaken.

1.1.2. Human activities in Antarctica must avoid or minimize adverse impacts on the Antarctic environment and its dependent and associated ecosystems.

Comment: This is the second of the Chairman's principles.

1.1.3. The regime needs to identify general and uniform standards applicable to human conduct.

Comment: The New Zealand working paper put the need for general or "basic" standards in the following terms: "... (I)n order to ensure a properly integrated, comprehensive and internally consistent regime of environmental protection, it is desirable that there be elaborated a series of basic standards that must be met by all forms of human activity in the Treaty area" (XV ATCM/WP/4, p.2). Chile expressed a similar view: "All human activity should be subordinate to a set of fundamental rules and juridical principles that specify and complement those already existing in the Antarctic Treaty System" (XV ATCM/WP/7, p.5). Sweden stressed "the need to develop further the basic standards for all forms of human activity in the Treaty Area" (XV ATCM/WP/14, p.3).

1.1.4. The regime should anticipate potential activities and damage with a view to assessing the acceptability of the activity in accordance with the standards laid down in the regime.

Comment: As the Chilean paper has stated, the Treaty Parties should continue to apply their consistent practice of making provision in anticipation of events (XV ATCM/WP/7, p.1). That paper also states that "... attention should be given to possible measures with regard to activities foreseeable in the short and medium future so as to prepare provisions that have been approved and are in force when these activities eventually come about" (ibid, p.5).

1.1.5. The regime should ensure that the environmental impact of any activity is kept within acceptable limits. Where this is not reasonably possible, the activity should be prohibited.

Comment: The Chairman of Working Group I at ATCM XV put forward a similar idea when he suggested that "human activities in Antarctica must avoid and minimise adverse impacts on the Antarctic environment and its dependent and associated ecosystems". Chile has added that "... it should be established that any activity that has environmental consequences which are not compatible with the principles and objectives of Comprehensive Measures (Chile proposed) should not be carried out" (XV ATCM/WP/7, p.8). It will thus be necessary to identify clearly what the acceptable limits are.

1.1.6. In identifying the acceptable limits, the regime should provide that activities in Antarctica must avoid:

(a) significant adverse effects on global or regional climate or weather patterns;

(b) significant adverse effects on the air and water quality;

(c) significant changes in the atmospheric, terrestrial or marine environment;

(d) significant changes in the distribution, abundance or productivity of population or species of fauna or flora;

(e) further jeopardy to endangered or threatened species or populations of such species;

(f) degradation of, or substantial risk to, areas of special biological, scientific, historic, aesthetic or wilderness significance.

Comment: These criteria were put forward by the Chairman of Working Group I at ATCM XV. They seem also reflected in a proposal put forward by Chile (XV ATCM/WP/7, pp. 6-7) and in the New Zealand paper (XV ATCM/WP/4, p.3).

1.1.7. The regime should incorporate criteria of what is significant harm, so as to permit informed judgements to be made on whether a likely impact would exceed the acceptable level.

Comment: Such criteria might take into account a number of elements such as extent by area, duration and intensity of impact. As Chile has mentioned, there may be a "... need to establish criteria for what is to be considered a 'significant' activity that has consequences for the environment. It is possible to conceive the usefulness of preparing some guidelines to determine the significant character of an activity, including the concept of harmful interference" (XV ATCM/WP/7, p.9). Chile has also mentioned one possible element when it suggested that significant degradation would occur when "effective restoration is not possible within a reasonable period of time" (XV ATCM/WP/7, p.7). A widespread impact may also be significant even if restoration were possible within a reasonable period.

1.1.8. Decisions on activities in Antarctica must be based on sufficient information to enable informed judgements to be made about their possible impacts on the Antarctic environment and its dependent and associated ecosystems.

Comment: This criterion was put forward by the Chairman of Working Group I at ATCM XV (Chairman's principles, para. 4) and would seem to give expression to the Chilean proposal that Parties need to adopt "informed decisions" (XV ATCM/WP/7, p.6). It is also supported by the New Zealand paper (XV ATCM/WP/4, p.3). The United States (SV ATCM/WP/8, pp.3 and 7) and Sweden (XV ATCM/WP/14, p.3) emphasized the need to set up a data bank.

1.1.9. In judging whether a proposed activity would have an acceptable level of impact it would be necessary to take the following fully into account:

(a) the cumulative impacts of similar activities and other existing or planned uses of Antarctica;

Comment: cf. Chairman's principles, para. 5(i).

(b) whether technology and procedures are available to provide for safe operations;

Comment: cf. Chairman's principles, para 5(iii).

(c) whether there exists the capacity to monitor key environmental parameters and ecosystem components, so as to identify any adverse effects of such activity;

Comment: cf. Chairman's principles, para. 5(iv).

(d) whether there exists the capacity to respond effectively to accidents, particularly those with potential environmental effects;

Comment: cf. Chairman's principles, para. 5(v).

(e) whether any activity in Antarctica will detrimentally affect any other activity;

Comment: cf. Chairman's principles, para. 5(ii).

1.2 The regime should establish Antarctica as a "land of science" by laying down the following principles:

1.2.1. Scientific research should have priority over other human activities in the Antarctic.

Comment: Scientific research should not have to compete with any other human activity. The Antarctic Treaty accords a privileged place to such research. Among the relevant measures which the Consultative Parties have adopted in favour of science, particular mention can be made of "the Sites of Special

Scientific Interest". The above principle is closely related to the principle already proposed in paragraph 1.1.9 (e) supra. If, on examining the cumulative environmental effects of the whole range of activities in a particular area, it were found that a new scientific activity could not be undertaken without activities other than scientific research being reduced, ways and means would conceivably have to be sought of reducing those activities, so as to enable such new research to be carried out. In the same spirit, it would also be possible to envisage that priority be given to scientific uses in the case of conflicting land uses on the Antarctic continent.

1.2.2. The contribution of scientific research should be regarded as essential in the comprehensive regime for protection of the Antarctic environment and its dependent and associated ecosystems:

(a) The Parties to the Treaty should encourage scientific research, in particular in the form of multinational co-operative programmes, devoted to acquiring a deeper understanding of the Antarctic environment and its dependent and associated ecosystems.

Comment: cf. Chairman's principles, para. 7.

(b) Any decision or general measure concerning the protection of the environment taken by the Consultative Parties should be preceded by consultation with relevant scientists and experts.

(c) In the event of an organized group of scientists and experts being established, it should be acknowledged as being empowered to propose to the Consultative Parties any measure that would be likely to improve the protection of the Antarctic environment and its dependent and associated ecosystems.

(d) Scientific data should play a particularly important role in the protection of the environment: there should be appropriate mechanisms to provide for the compilation, review and utilization of the relevant data and information, particularly in order to ensure that the results of monitoring and scientific research are effectively applied in assessing and, where necessary, revising and extending environmental standards and procedures applied to human activities.

Comment: The United States proposed the creation of a scientific data management system (XV ATCM/WP/8, p.6). Sweden also suggested that a scientific data base be created to support the monitoring of environmental variables (XV ATCM/WP/4, p.3). The importance of the role of scientific data should not be taken as requiring scientific proof of likely damage before precautionary protective action may be taken.

1.2.3. The co-ordination of scientific research, and international co-operation in that field, should be given fresh impetus, so as to avoid, as far as possible, the repetition of work already carried out and thereby limit its global effects on the environment.

Comment: Article 2 of the Antarctic Treaty aims at fostering co-operation in scientific research. In document XV ATCM/WP/7 p.6, Chile stated that the regime should reflect the requirement of the Antarctic Treaty to maintain scientific research in Antarctica, increase co-operation to that end and exchange scientific information. A similar idea is reflected in paragraph 7 of the Chairman's principles.

2. The comprehensive regime for the protection of the Antarctic environment and its dependent and associated ecosystems should form an integral part of the Antarctic Treaty system.

2.1 This regime should fully reflect the provisions of the Antarctic Treaty and should make express reference to those provisions concerning the following:

2.1.1. the fact that Antarctica is dedicated exclusively to peaceful purpose, so that it does not become the scene or object of international discord;

2.1.2. the freedom and encouragement of scientific research;

2.1.3. the protection of the legal positions under the Antarctic Treaty. In this respect, the comprehensive regime for the protection of the Antarctic environment should in no way detract from the provisions of Article IV of the Treaty and should be acceptable to all the States asserting rights or claims to territorial sovereignty in Antarctica, as well as to States which do not recognize

or assert such rights.

In particular, it should not be interpreted as a renunciation or diminution by any Party of any right or claim or basis of claim to territorial sovereignty in Antarctica.

Moreover, it may not be interpreted as prejudicing the position of any Party as regards its recognition or non-recognition of any such right, claim or basis of claim.

2.1.4. the fact that the Consultative Parties to the Treaty bear special responsibility for ensuring that all activities carried out in the Antarctic are consistent with the objectives and principles enshrined in the Treaty.

2.1.5. the maintenance and development of information exchanges.

Comment: Pursuant to this proposal, Chile stated that "the conceptual framework ought to include traditional formulations that govern the Antarctic Treaty System" (XV ATCM/WP/7, p.6). Sweden stated that "the general principles should recall the basic objectives and components of the Antarctic Treaty System" (XV ATCM/WP/14, p.3). The above provisions relate to the preamble and to Articles I, II, IV and IX of the Antarctic Treaty.

2.2 The comprehensive regime for the protection of the Antarctic environment and its dependent and associated ecosystems should not prejudice the international conventions currently in force under the Antarctic Treaty System. There should, however, be provision for communication and coordination to promote consistency between the proposed comprehensive regime and the different existing instruments.

Comment: As the Chilean working paper has proposed, a set of rules should be devised which are "without prejudice to the other instruments currently in force" (XV ATCM/WP/7, p.1). This reflects the necessity of having regard to existing realities, such as the Convention on the Conservation of Antarctic Marine Living Resources. This was also recalled by Sweden in its paper (XV ATCM/WP/14, p.1). That said, the Consultative Parties will need always to be conscious of the possibility and dangers of uncoordinated action in different forums. The comprehensive approach should have regard to means of enhancing co-ordination, particularly in the application of general standards, environmental assessment, monitoring and enforcement between various elements of the Antarctic Treaty System by developing existing structures and procedures (cf. infra para. III.11).

III. PROTECTIVE MEASURES

1. Procedures for activities of differing levels of impact

It will probably be necessary to subject different activities to different procedures. Activities could be identified as follows:

1.1 Specified activities whose impact cannot be kept within acceptable limits shall be prohibited.

Comment: Disposal of nuclear wastes and nuclear explosions even for peaceful purposes are examples of activity which the Antarctic Treaty itself expressly rules out. The Australian and French Governments would see mining as falling within the category of activity which should be prohibited. Provision should be made for particular classes of activity to be added to or deleted from this list.

1.2 An unspecified category of activity which may be permitted only if:

(a) there is an in-principle decision in favour of that activity taking place;

(b) a specific, planned course of action satisfies a procedure to assess its environmental impact; and

(c) other conditions that the institutions may lay down for any particular class of activity are satisfied.

1.3 Specified activities which may be undertaken subject to a favorable institutional assessment on the basis of an initial environmental evaluation prepared by the national authority, unless the institution calls for

comprehensive environmental evaluation.

Comment: This category would include activities which experience has shown can generally be carried out without excessive environmental impact. It would thus include activities which in-principle are permitted. There should, however, be provision for a comprehensive environmental evaluation to be required if, in relation to any particular proposed activity, there is doubt. Provision should be made for classes of activity to be added to or deleted from this list.

Sweden drew attention to a "need to define the human activities involved that cause environmental concern" (XV ATCM/WP/14, p.2).

2. Subsidiary measures

Provision will need to be made for the establishment of detailed measures in implementation of the general standards and to provide for the effective implementation of the regime. The implementation measures should come within the competence of the new environmental body.

3. Environmental impact assessment

3.1 All human activity in the Antarctic should be preceded by an assessment of its environmental impact, demonstrating that it does not entail any effects incompatible with the protection of the environment as provided for under the comprehensive regime.

Comment: In preliminary discussion at ATCM XV, there was a widely shared view that environmental impact procedures should apply to all human activities in the Antarctic and not just to decisions about scientific research programmes and their associated logistic support facilities, as presently provided for under Recommendation XIV-2 (XV ATCM report, para. 99). As the New Zealand working paper says: "... (T)he nature, extent, duration and probability of impacts need to be assessed regardless of the type of activity e.g. science or tourism" (XV ATCM/WP/4, p.6). Chile put forward a similar view: "All activities, including scientific research, tourism, navigation and the installation of new stations should be preceded (by) evaluation of their environmental impact..." (XV ATCM/WP/7, p.7). The United States identified environmental impact assessment as one of the procedures which will have to be involved (XV ATCM/WP/8, p.2). Sweden stated that "the environmental impact assessment instrument should be further developed to cover all activities in Antarctica" (XV ATCM/WP/14, p.3).

3.2 The procedure should apply to all stages of an activity, including the decommissioning of facilities and review of completed environmental assessments when monitoring throws doubt upon the extent of impact that an activity is actually having. The procedure should also apply in case of substantial change in this activity, or of adding a new activity to it.

Comment: As was pointed out by some delegations at ATCM XV, environmental impact procedures "should apply to any stage of an operation, including, for example, the decommissioning of facilities. This is consistent with the 1986 recommendation of SCAR" (XV ATCM Report, para.100). The New Zealand Working paper states: "It is also important that the procedures should apply to all stages of an activity. In this respect, New Zealand endorses the comment by SCAR that EIA procedures should be applied to the decommissioning of facilities" (XV ATCM/WP/4, p.7). Consideration may need to be given to adapting the system of environmental impact evaluation to facilitate speedy consideration of activities expected to have only fleeting or trivial impacts.

3.3 Any organization planning activities in Antarctica should, in good time, forward initial environmental impact assessments for each such activity to the new environmental body which could be established, in order to enable it, with the assistance of relevant scientists and experts, to determine whether the planned activity is consistent with the regime and to propose appropriate corrective measures or require a comprehensive assessment to be carried out.

Comment: Recommendation XIV-2 concerns environmental assessments in respect of research programmes and their logistic supporting services. This is supplemented by the provision proposed above, which covers the whole range of human activities. It spells out the provisions contained in paras 3.1 and 3.2 above.

3.4 Environmental assessment should be circulated to the Parties for comment. Scientists and experts should also make their comments on such assessments. Arrangements could be considered for making such assessments available to relevant non-governmental organizations. Provision should also be made for

annual reports by the new environmental body on the state of the environment in the Antarctic and for this to be made public.

Comment: Obtaining a wide range of comments should be an important element of the decision making process. In its paper on comprehensive measures, Chile has pointed out the value of circulation of environmental impact assessment: "... the obligation to circulate in a timely manner the environmental impact assessment reports should be established, particularly when they refer to activities that may have a considerable impact" (XV ATCM/WP/7, p.14). As New Zealand has stated in relation to existing procedures: "Advantage could also be taken of comments on Comprehensive Environmental Evaluations offered by other Treaty Parties as well as interested intergovernmental and non-governmental organizations and other experts" (XV ATCM/WP/f p.7).

4. Monitoring

Continuous and effective monitoring should take place to verify the predicted effects of all activity in the Antarctic and to detect the possible unforseen effects on the Antarctic environment and its dependent and associated ecosystems.

Comment: This was in para. 6 of the principles proposed by the Chairman of Working Group I at ATCM XV. New Zealand has pointed out that "...(m)onitoring of ongoing activities is a standard environmental protection technique, but it has not been given a great deal of attention to date in measures adopted under the Treaty system. The Treaty Parties should agree to apply effective and open monitoring and reporting procedures to all major activities in Antarctica such as the operation of stations and substantial field operations. These procedures should also be applied to other significant activities such as areas where tourist activities are concentrated" (XV ATCM/WP/4, pp. 8-9). Chile has also identified the possible need to "establish some monitoring schemes which should include an 'early warning system' and follow-up procedures of the activities that are being conducted in Antarctica" (XV ATCM/WP/7, p.14).

The United States also considers environmental monitoring as essential; it states: "The increasing intensity of human activities affecting Antarctica emphasizes the importance of monitoring programmes to identify and keep under review impacts upon the environment. The issue of environmental monitoring is a key component in addressing comprehensive measures "(XV ATCM/WP/14, p.5). Sweden, in its working paper (XV ATCM/WP/14, p.3), proposes, among examples of the steps to be taken, that an early-warning system be set up. The creation of a scientific data base was advocated by the United States and Sweden (cf. supra para II 1.2.2. (d)).

5. Modification or cessation of activities in response to environmental impact.

Provision should be made for the review and modification of operating procedures for an activity or the termination of it when this is shown to be necessary in the light of the results of monitoring or increased knowledge of the Antarctic environment and its dependent or associated ecosystems.

Comments: This proposal seems to follow from principle 5 (d) proposed by the Chairman of Working Group I at ATCM XV.

6. Zoning scheme

The regime should establish a zoning scheme for areas meriting particular protection where certain activities otherwise permitted may be restricted or, where necessary, prohibited.

Comment: The scheme could be consistent with the existing protected area system but could rationalize it by establishing simpler categories. Area and uses designated under the existing system should be recognised and given an equivalent level of protection and management. The existing scheme of protected areas under the Antarctic Treaty System, with appropriate co-ordination and rationalisation, could be reflected in the comprehensive regime. As New Zealand has pointed out: "Establishment of areas within Antarctica to be given special protection is an effective way of ensuring the preservation of unique wildlife and vegetation sites and other outstanding natural, cultural, historic and scientific features" (XV ATCM/WP/4, p.7). The United States advocates "further development of protected areas for Antarctica (XV ATCM/WP/4). Similarly, Sweden proposes that "the network of protected areas should be reviewed" (XV ATCM/WP/14, p.4). In this same connection, Chile puts forward a number of proposals in its paper (XV ATCM/WP/7 p.12), namely: "the establishment of areas of special tourist interest, in order to concentrate those activities in one place, where they would be conducted subject to strict preservation criteria"; and elaboration of "a

new concept (concerning protected areas), in order that it not only serve to fulfil scientific objectives but also serve as an instrument of environmental protection".

7. Prevention and response action

There should be provision for effective and timely action at three levels:

7.1 Prevention of damage to the environment.

Comment: This aspect was considered above with respect to the drawing-up of basic standards and prior environmental impact assessments, the possibility of modifying or suspending certain activities liable to constitute a threat to the environment, and the monitoring system.

7.2 Cleaning-up of sites in the event of damage.

7.3 Emergency plans in the event of accidents.

Comment: It would be incumbent upon the new environmental body which could be established to draw up such emergency plans on the basis of co-operation between the Parties, depending on the areas concerned and the nature of any accidents. The provisions set out in Recommendation XV-4 on marine pollution represent a first step which it would be advisable to specify more closely and make more wide-ranging.

8. Liability

Provision should be made for liability in the event of damage. Questions which could be addressed include the following:

(a) the scope of application: whether all or only some activities would give rise to liability;

(b) the basic rules of liability: whether strict liability or a regime based on fault; defences; definition of damage; measure of damages including costs or response action;

(c) mechanisms for determining and enforcing liability, including tribunals for adjudicating claims.

Comment: New Zealand has pointed out that "...(c)onsideration should now be given to the best means for dealing with this fundamental issue with regard to other activities in Antarctica" (XV ATCM/WP/4, p.8). The matters listed above include issues that the New Zealand working paper has identified to be among those that should be addressed. Chile too has stated that liability should be addressed. In its view, "enterprises and individuals are liable for the activities they are conducting in Antarctica" (XV ATCM/WP/7, p.7). It has also raised the question of insurance to cover environmental damage (ibid, p.12). The United States (XV ATCM/WP/8, p2) and Sweden (XV ATCM/WP/14, p.4) also regard liability as an important issue.

9. Enforcement of the regime

9.1 The States Parties should represent an annual report to the new environmental body which could be established on the manner in which they have implemented the comprehensive regime for environmental protection. This report could be made publicly available.

Comment: This suggestion was made by Chile in its paper XV ATCM/WP/7, p.14.

9.2 Apart from measures to enforce the regime by devices such as monitoring and a dispute settlement procedure, states which adhere to the regime would, in accordance with the usual principles of international law, be responsible for observance of the international obligations imposed by the regime.

Comment: As Chile has pointed out: "States are responsible for the observance of their international obligations related to the environmental protection and preservation of Antarctica. They will be responsible in accordance with international law" (XV ATCM/WP/7, p.7). The United States, in its paper (XV ATCM/WP/8, p.5), stated that it is necessary "to make clear to governments and all those involved in activities in Antarctica the legal requirements and obligations

that they must observe in carrying out such activities."

10. Status of the regime

To ensure compliance with its provisions, the regime should be binding under international law which can best be achieved by it being embodied in a document of treaty status.

Comment: Chile has proposed that there should be adopted "a set of rules of a mandatory nature" set out in a "binding instrument containing the Comprehensive Measures" (XV ATCM/WP/7, pp.1 and 4) and that "States Parties should assume the obligation to fulfil them" (ibid, p.14). These rules should be drafted in precise juridical terms "in order to obtain their full compliance" (ibid, p.5). The United States has said that"...(o)ne of the most important contributions that could be made to achieving an effective and comprehensive network of environmental protection measures is to ensure that these measures (existing and future) are formulated so as to make clear to governments and all those involved in activities in Antarctica the legal requirements and obligations that they must observe in carrying out such activities. In its approach to waste disposal, to marine pollution and to the protected area system, for example, the United States has sought not only to articulate effective standards but to cast them as clear and enforceable obligations" (XV ATCM/WP/8, pp.4-5).

Suggested provisions on settlement procedures are among other elements of the regime that would need to be in a legally binding form. There is considerable doubt whether the desired legally binding force could be obtained by the embodiment of the regime in a recommendation adopted by the Consultative Parties. The Antarctic Treaty does not specifically endow recommendations, even when approved by Governments, with legally binding force. What is more, as evidenced by the manner by which each Consultative Party treats them under domestic procedures, there is no consensus among those parties that they are legally binding.

The most effective way of removing doubt about the legally binding force of the regime would be to have it embodied in a document of treaty status within the the broad meaning given to that term by the Vienna Convention on the Law of Treaties. It is for this reason that the Australian and French Governments suggested that the regime should be set out in a convention. Such an approach is not novel. For example, when consideration was being given in 1962 to the establishment of "internationally agreed measures for the preservation and conservation of living resources of the Antarctic", the United Kingdom stated that "an International Convention is the best method of dealing with this problem" (ATCM II document Memo Exp1.1 of 17 July 1962) and submitted the draft of a convention (ATCM II document, p.2).

As the delegation of Belgium pointed out in its statement at the session of the XVth Consultative Meeting on 10 October 1989 on comprehensive measures: "The reasons which prompted the adoption of conventions in such areas as the protection of seals or living marine resources should be even more far reaching for an issue like the protection of the Antarctic environment."

As well as the instrument setting out the regime being legally binding itself, it would also be necessary to provide in that instrument that the subsidiary measures adopted under it be legally binding.

11. Relationship to existing instruments

One of the guiding principles behind the regime is respect for the existing instruments (cf. supra II 2.2.). The practical implementation of co-operation between the different elements of the Antarctic Treaty System, on the basis of respect for their respective areas of competence and having in mind the common goal of conservation, could take advantage of existing procedures and provisions, namely:

(a) agreements between various institutions of the Antarctic Treaty System as is, for example, provided for by article XXIII of the Antarctic Marine Living Resources Convention;

(b) giving express effect to provisions such as Article V (2) of the Marine Living Resources Convention "to observe as and when appropriate measures recommended by Consultative Parties in fulfillment of their responsibilities for the protection of the Antarctic environment from all forms of harmful human interference";

(c) relevant institutions introducing measures co-ordinated with other elements of the Antarctic Treaty System.

IV. MEANS OF IMPLEMENTATION OF THE REGIME

1. Rationale for creating a new environmental body or bodies

A comprehensive regime for protection of the Antarctic environment and its dependent and associated ecosystems will require effective means for implementing the regime and monitoring its application.

The present practice of holding relatively short periodic Antarctic Treaty Consultative Meetings (ATCMs) appears increasingly inadequate at a time when the need for an extensive further programme of complex environmental decision-making, involving considerable scientific and technical input, has been clearly identified by a number of Antarctic Treaty

Consultative Parties. There are strong arguments in favour of having additional institutional machinery not only in order to assist effective and timely decision-making, but also to oversee implementation of response action in the event of accidents.

2. Three broad options for developing improved means of implementation can be identified:

2.1 The first option is to seek to develop procedures for improved decision (or recommendation) making by ATCMs.

This might be effected by the creation of a standing advisory body/working group, which would enable better preparation of recommendations at ATCMs. Such an arrangement would have the advantage of maintaining the ATCM as the effective policy-making body on environmental issues, issues which in recent years have made up a significant part of the work of ATCMs. This would mean, however, that the decisions under the comprehensive environmental protection regime would be subject to the existing slow consultative mechanism for recommendations. Final decisions could not be taken at the relevant meeting but would require follow-up consensus approval in accordance with Article IX (4) of the Antarctic Treaty. Under the present arrangements, this process takes some years. There is also doubt that at the end of the day the decision would be legally binding. Provision could be made for separate procedures for the timely adoption of legally binding environmental measures but this may involve an amendment of the Antarctic Treaty.

Comment: New Zealand proposed the creation of a Standing Working Group on the Antarctic environment along lines similar to this (XV ATCM/WP/4, pp.14-15).

2.2 The second option would be to establish a body with exclusive decision-making powers on environmental questions. This is the option which has been chosen in the cases of CCAMLR and CRAMRA within the limits of their fields of competence and is envisaged as a possibility under CCAS.

In this case it might be decided that only the Consultative Parties make up the membership of the new body competent to make environmental decisions. This would safeguard the substantive concern of the Consultative Parties to remain responsible for Antarctic environment decisions. It would of course be necessary to provide that the instrument shall enter into force only after the Consultative Parties have become parties to it.

2.3 A possible intermediate option might involve a new body, called say the Commission, to be established as part of the comprehensive regime. The role of this Commission would be to take any measure designed to implement the principles and objectives laid down in the comprehensive regime or in the recommendations adopted consistently with the regime at ATCMs. In this case, the ATCM might have a role loosely comparable to that of a Parliament with the Commission having an executive role. While the ATCM could indicate broad lines of policy and directions of work, consistent with the comprehensive regime, the Commission could be responsible for detailed implementation and monitoring. This new executive body, which might consist exclusively of representatives of the Consultative Parties, could also assist in preparing the work of the ATCMs and could report back to ATCMs on its activities. It might be a standing body which meets as often and for as long as necessary to discharge its tasks.

This third option would provide a continuing role for the Consultative Parties in environmental decision-making at ATCMs. It would also allow a flexible, detailed response to the many issues

arising in the environmental management of Antarctica.

3. General considerations on the organization of a scientific and experts group and secretariat

These options and other variations on them that may be identified will require extensive consultation among the Treaty Parties, It will be important to find a solution that would enable the regime to be effectively applied.

The nature and function of any additional body or bodies to be established for implementing the comprehensive regime will depend on which option is favoured by the Treaty Parties. One question which will arise, whichever option is favoured, will be bow best to ensure that the new body which is created has adequate scientific and technical expertise available to it to inform its work. Consideration will need to be given to whether this would best be provided by the creation of a separate standing scientific and technical committee (along the lines of the scientific committee of CCAMLR) or whether provision might be made to have the required expertise available within the new body itself.

The Treaty Parties should also examine the desirability of establishing a small cost-efficient secretariat having environmental expertise.

Comment: As New Zealand has proposed (XV ATCM/WP/4, p.14) it would be possible for any secretariat which may be established to serve the needs of the Antarctic Treaty consultative process to serve also as a secretariat for the environmental regime.

V. OBSERVER SYSTEM AND DISPUTES SETTLEMENT PROCEDURE

1. The observer system

1.1 The regime should make provision for an observer system to monitor compliance with its provisions. Observers or inspectors should enjoy complete freedom of inspection throughout the entire area, including sea, ice shelves and land, covered by the regime.

Comment: Sweden proposes that "steps should be taken to ensure more effective use of the inspection system" (XV AT CM/WP/14, p.14). Inspections should be authorised of sites of research activity and logistic support facilities and activities.

1.2 The national inspectors provided for in Article VII (1)-(4) of the Antarctic Treaty should be given specific authority to carry out inspections under the proposed regime.

Comment: In addition to their other functions, the practice has evolved of national observers under the Antarctic Treaty monitoring compliance with environmental measures. Chile has proposed that the system of inspections, included in the Antarctic Treaty, could be extended to provide an "early warning system" on the possible environmental effects of activities (XV ATCM/WP/7, p.9). The proposed regime would formalise this arrangement, giving observers a clear mandate on environmental questions.

1.3 The regime should provide for the establishment, by the new environmental body which could be created, of consistent criteria and standard procedures to be applied by national and other observers or inspectors in carrying out their duties to verify the consistent application of environmental protection standards.

Comment: New Zealand has pointed out the absence of consistent criteria and that "there are at present no standard procedures to be applied by inspection teams to inquire into compliance with environmental protection requirements agreed to by the Treaty Parties" (XV ATCM/WP/4, p.9).

1.4 To supplement the system of national observers, there should be a system of inspection to be carried out on behalf of the new environmental body which could be established.

Comment: The system of national inspection has shown itself to be imperfect so far as monitoring of environmental standards is concerned. While its implementation may be improved, there is scope for supplementation by a more systematic approach which a team of inspectors acting on

behalf of the environmental commission would make possible. As New Zealand has pointed out, it is appropriate to adopt the precedent offered by the Minerals Convention "...because of the growing recognition of the importance of the protection of the Antarctic environment and the need for the Treaty Parties to establish an effective environmental protection regime" (XV ATCM/WP/4, p.15).

2. Disputes settlement procedure

2.1 In additional to requirements of consultation concerning disputes, there should be a procedure whereby a party to a dispute concerning the interpretation and application of the regime should be entitled to refer the dispute to an arbitral body.

Comment: New Zealand has pointed out that at present the Treaty system has only minimal procedures for ensuring compliance with mandatory measures that have or will be adopted to protect the environment, and that "following the example of the Minerals Convention, the Treaty Parties should develop a set of binding disputes settlement procedures that would apply to damage or potential damage to the Antarctic environment or its associated or dependent ecosystems..." (XV ATCM/WP/4, p.9). Again to quote the New Zealand paper, a binding dispute settlement procedure "would considerably strengthen the Treaty and would be a major advance in the protection of the Antarctica environment" (ibid, p.10).

2.2 The procedures should include:

2.2.1 the identification of agreed categories of disputes to be covered by the procedures;

2.2.2 a mechanism for the convening of a tribunal or panel of arbitrators to hear and decide the disputes;

2.2.3 a mechanism to enable the rapid hearing of, and decision on, any dispute involving serious or potentially serious damage to the environment.

Comment: The New Zealand paper identified these issues as requiring attention (XV ATCM/WP/4, p.10). The disputes settlement tribunal might be the International Court of Justice or an arbitral tribunal.

2.3 The jurisdiction of the arbitral body should not extend to the exercise of discretion of the body established under the regime.